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# CAN'T WAIT

MUST HAVE NOW

**I**t's not all sunshine and roses being an early adopter. Balanced against satiating your tech lust at the earliest opportunity, discovering and sharing things before others, and heck, bragging rights, is a minefield of potential grief.

We're seeing it with Skylake CPUs and Z170 motherboards out of the gate. It's the usual suspects this time around, being stock shortages, inflated prices in the channel exploiting these shortages, and some nasty DDR4 memory incompatibilities. The stock and pricing issues will resolve very quickly, and should be stabilised by the time you read this. It's interesting, though, that the actual CPUs were available far cheaper than expected – it was possible to find both the i7 6700K and i5 6600K discounted by around \$50 on day one. That in itself is remarkable because I know that the number of CPUs that landed in Australia for launch was very low. Very very low. It's also telling that Intel never publically set a recommended retail price, which is most unusual. It's nice that the market immediately responded with some real bargains to be found with not much hunting.

Motherboards, on the other hand – which very much were being put into the channel with a strong RRP encouragement from the manufacturers – saw price spikes, typically in the order of \$30 - \$50. And as far as I know there weren't notable stock shortages, other than possible short supply of certain boards simply because there were so many models launched on day one, so finding a particular and popular board may have been tricky, but getting a Z170 board if you weren't particular was easy.

Thus, early adopters may have to pay a little more, and hunt a little harder. Unexpected was a bit of grief with DDR4. In our testing Bennett had ongoing issues. Some RAM kits wouldn't even boot on some boards, but would on others. Some only worked with a single stick.

The takeaway is that we strongly recommend that you visit the manufacturer's website for the model you have decided upon and look for a list of officially approved compatible DDR4. If no such lists are published, choose a board that does have that information.

It's all a bit surprising, given that DDR4 has been with us since the X99 platform, which had been widely available since November last year – even earlier for the true early adopters. We're not aware of any ongoing issues with X99 and DDR4, and thanks to X99, memory manufacturers have had plenty of time to gain experience producing this memory.

Regardless, there will be many of you who, right now, have a Skylake + Z170 + DDR4 system up and running, and, hopefully, delivering the goods. I'm building my own this weekend, and I'm as optimistic as I am excited. I'll let you know how that went, and the bits I chose next issue. Until then, "the best is yet to come".



**Ben Mansill**  
Editor

[bmansill@nextmedia.com.au](mailto:bmansill@nextmedia.com.au)

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- We put tech through its paces – seriously. From processing power to battery life, from usability to screen brightness, our tests are exhaustive
- We will always offer an honest and unbiased opinion for every review

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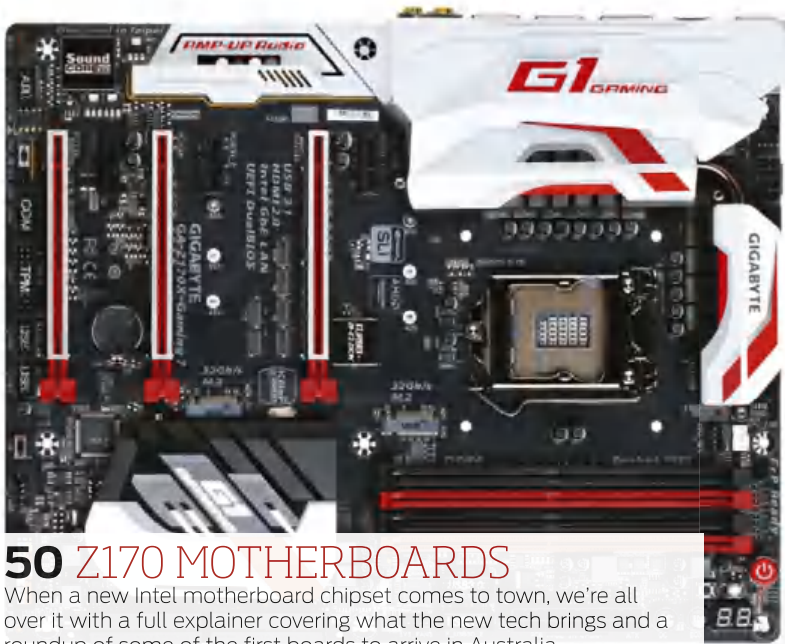
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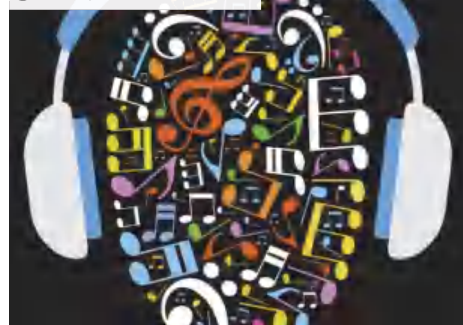
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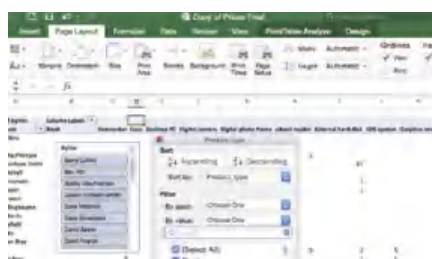
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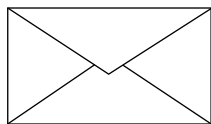
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# INBOX

Lettuce peak

## LETTER OF THE MONTH

I am an 81 year old retired senior officer of the RAAF, where my interest in computers began. The Air Force was the first of the three Australian armed services to be equipped with a mainframe computer. It was very primitive compared to modern technology, but led me to a lasting use of personal computers.

My first computer was expensive, but constant upgrading was as irresistible as it was costly. Eventually it was PC gaming that gave me the greatest enjoyment.

One of my first games was a WWI flight simulator by Microsoft. I thought it was so wonderful to be able to take off, battle and land – albeit with a ‘world’ not much bigger than a football oval. The graphics required some imagination. Technology made rapid and exciting progress. I became able to fly WW2 combat aircraft, and I never dreamt that I would experience flying and fighting in aircraft like Spitfires, Hurricanes, ME109s, ME 110s or JU88s.

I can only admire the many talented people who have designed and produced computer games, and continue to do so. The graphics I see on my large screen just keep getting more and more realistic and wonderful. With Far Cry 3 I could almost smell the salty ocean. I find the Far Cry scenery utterly transporting.

Having read your flattering review of Grand Theft Auto V, I bought it and can only say that the ambience, realism and detail of its graphics and sound are simply amazing.

However, there was a problem for me in being able to manipulate keys and my mouse fast enough to win pivotal melees in Far Cry 3. I eventually found a way to slow the game down to succeed.

What I saw was that I was missing hints about keys to use in rapid sequence – as if being able to do this is clever.

To me, many game producers lack a wide appreciation of their great variety of customers. In modern technology generally, client variety, skills and needs seem too often to be underappreciated. An example is that GTAV play seems to favour console game pads with which flying is no problem for players, I believe. I get the impression that game marketers believe that nearly all players are young, fast, highly dextrous, and efficiently use tricky little game pads.

Despite my criticisms, I would reiterate what a great thing it is in my old age to be able to enjoy absorbing, exciting, and highly picturesque games using amazing technology.

I am always reminded of the fascinating English training films shown during my computer course decades ago that always ended with the words “and the best is yet to come”. I look forward to this.

**Wing Commander Lindsay Williamson**

**Ben Mansill replies:** WGCDR Williamson's letter arrived in an envelope, spans five enthralling pages (the above is edited to fit) and has been shared around the office where it's put a smile on every face.

The local Logitech people cheerfully agreed to send WGCDR Williamson a nice Extreme 3D Pro joystick as a very appropriate LOTM prize.

## MEASURE TWICE, CUT ONCE

Hasn't technology taken off with a bang in the last five to ten years, and even in the last two years. I am just a self-taught geek and do my best by reading articles both online and your magazine. Some of the articles just do my head in and I don't understand a lot of the technojargon.

My latest conundrum is all the hype

surrounding M2 technology and PCIe SSD's and all the different types. When researching my motherboard I didn't go right into the small details, more fool me. I bought an ASUS Maximus VII Formula. It had all the bells and whistles, even an M.2 slot. It sold it on the front page as M.2 (SATA/PCIe x2) support. In the specs it just said M.2. Socket 3, with M Key, type 2260 storage devices support (Both SATA & PCIe).

Well, it's not till you get your hands on the installation manual that you see that it has to be a 22 mm x 60 mm, and the socket is on the Wi-Fi plug in. The devil's in the detail. Most M2's on sale now are 22 x 80 mm and have either their own adaptor for one of the PCIe slots or the board itself has an independent M2 slot.

**James Howden**

**Ben Mansill replies:** Thanks for writing in, James, with your timely warning. Yes, M.2 SSDs come in various physical sizes, and not all motherboards support all sizes. It's an issue few people expected, but in time as more M.2 SSDs appear (there are hardly any now), more sizes will be available.

## WIN 10

As a PC-based musician, I use several peripherals: an external audio i/o, a quite complex MIDI controller, a drum pad controller and a (piano) keyboard controller – all going into my digital audio workstation. Most of these require OS-specific drivers, I am currently using Win 7.

This brings me to my point/s. Firstly I have to work out if those peripherals will work with W10 but more importantly; if W10 is constantly updating itself, how can I be assured that I can always have a working set-up? I find this a problematic and actually quite scary concept and I doubt I am alone in this consideration.

**Neil Anderson**

## LOTM WINNER

This month's letter of the month wins a Logitech Extreme Pro 3D joystick.

[www.logitech.com](http://www.logitech.com)



## WANT TO READ MORE?

Go to [www.pcandtechauthority.com.au](http://www.pcandtechauthority.com.au) and join in the conversation. Also check out the Atomic forums: <http://forums.atomicmpc.com.au>

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Please limit letters to 200 words, where possible. Letters may be edited for style and to a more suitable length.





# TECH NEWS

The latest trends and products in the world of technology

## WHY WINDOWS 10 WON'T MAKE ANY DIFFERENCE TO PC MAKERS

Windows 10 may be good for Microsoft, but it won't give PC manufacturers much of a boost. **Nicole Kobie** reveals why

**W**indows 10 has arrived – but PC manufacturers shouldn't count on a sharp spike in sales. In the past, the arrival of a new version of Windows has typically sparked a rush of hardware upgrades: after Windows 7 launched in 2009, PC sales saw a substantial boost, according to data from Gartner (see How previous Windows releases affected sales, opposite).

But since then, subsequent releases of Windows have kept the hardware requirements unchanged, and it's become unnecessary to invest in a new computer to run the latest OS. When Windows 8 and 8.1 launched, hardware sales actually followed a downward trend. And history looks set to repeat with Windows 10, which makes it easier than ever to install the new OS on your existing hardware.

"For the first time, Microsoft is offering consumers a free upgrade [to] Windows 10 if they have a valid Windows 7 or 8 licence, while for enterprises the upgrade position will depend on their licence conditions," said IDC analyst Chrystelle Labesque. "Consequently, Windows 10 could be a success as an OS, independently from hardware sales this time."

▼ For the first time, Microsoft is offering its new OS as a free upgrade

"Windows 7 needed additional hardware (storage or memory), and Windows 8 needed touch – but Windows 10 doesn't require fundamental hardware upgrades," Labesque added. "Therefore, the impact on PC [sales] is likely to be less significant because you don't need a new machine to run Windows 10."

IDC expects Windows 10 to have a positive impact on device sales – just not for PCs. Instead, Labesque predicts that tablets and smartphones might see a boost. That doesn't mean PC sales are terrible: last year was "an exceptionally good year for PC shipments following the end of Windows XP support," while consumers were tempted with low-cost laptops.

PC makers were more optimistic about the arrival of the new OS. David Furby, managing director of PC Novatech, said: "We're expecting to see an increase in sales when Windows 10 launches, although not instantly as, say, when Windows 95 or Windows 7 was launched."

That's less to do with the new OS and more to do with the last one, however. "Windows 7 to Windows 10 is a much



▲ The launch of Windows 10 may not boost PC sales

easier transition for the end user than Windows 7 to Windows 8," he said.

"Therefore we expect some people will have held off buying a new machine with Windows 8 on it, waiting for Windows 10, despite the free upgrade."

He believes the rolling updates won't have much of an effect, as people have stopped investing in new PCs to coincide with a new version of Windows. "In our experience, people tend to buy machines when the old one breaks and is beyond economic repair, or when there's a new technology or format released," Furby said.

Toby Roberts, a director at Wired2Fire, said the combination of Windows 10 and the Z170 chipset using the Intel Skylake architecture should give a "reasonable bump" in sales, and any negative impact from the shift to rolling updates would be limited to corporate deals. "As this is the last true brand-new OS, rather than the new evolving OS model, it may affect business purchases," he said. "However, our sales are driven by games, and this is more dependent on the demands games developers are putting on the hardware."

### DELAYED ARRIVAL

Another issue holding back PC sales is availability. Previously, Microsoft would



# WINDOWS PHONE: BY THE (TERRIBLE) NUMBERS

*Microsoft has wiped US\$7.6 billion from the value of its phone division – and the numbers keep on getting worse*

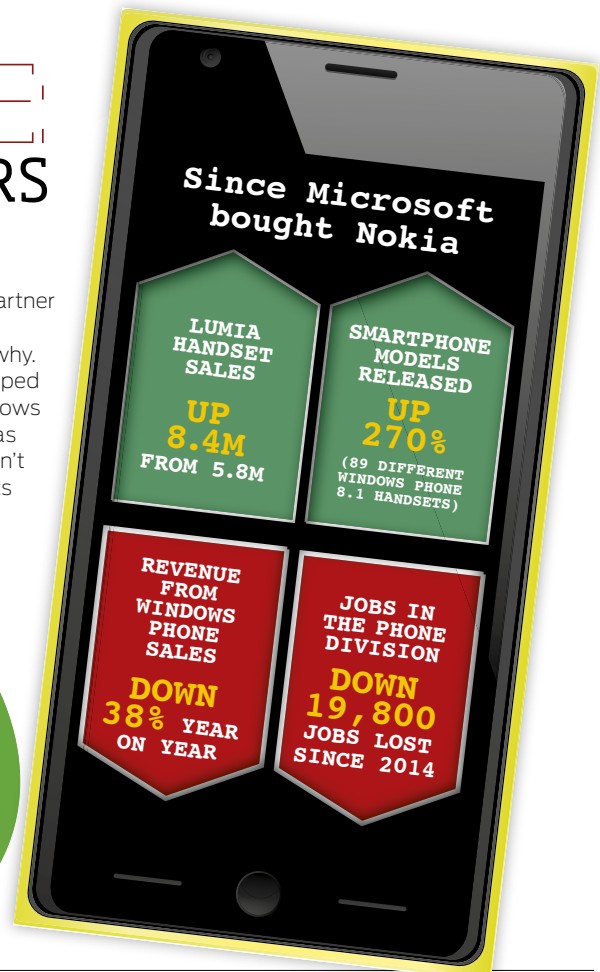
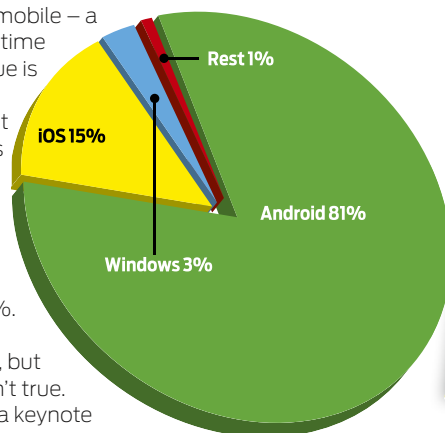
**M**icrosoft CEO Satya Nadella has some nasty numbers to chew over: the company has written down the value of its phone business by US\$7.6 billion, slashed 7,800 jobs (mostly from the phone division), and still holds only 3% of the mobile market.

When Nadella took the reins of Microsoft from Steve Ballmer in 2013, he said he'd refocus the firm onto cloud and mobile – a mantra he repeats almost every time he speaks in public. Cloud revenue is indeed growing, up 88% quarter on quarter in its latest results, but that \$2 billion in revenue remains just a tenth of Microsoft's overall sales. Mobile, on the other hand, posted steady declines – revenue from phone hardware is down 38% and mobile OS software licensing down 68%.

Rumours circulated that the phone division would be canned, but COO Kevin Turner said that wasn't true. "We're still in phones," he said in a keynote

at the Microsoft Worldwide Partner Conference – although it's not unreasonable to wonder why.

Microsoft's position isn't helped by the delayed arrival of Windows 10 on smartphones. Early betas have been flaky, and the OS isn't expected to arrive on handsets until autumn.



give PC makers as long as two months from RTM to the official release of the OS, making it viable for manufacturers to have new hardware on their shelves for launch day. This time around, Microsoft's RTM was only a fortnight prior to launch.

Furby said the shorter deadline had "absolutely" caused problems for the team, and that Novatech's full range of PCs wouldn't be available at launch, not least because component manufacturers may not have drivers ready.

However, Furby added that his "team of brilliant engineers" likes a challenge. "Once we get the final version of an OS (RTM), we have to package it up with the relevant drivers for our hardware options to ensure it installs quickly and easily in our production facility," he said. "All our range models will have to be individually tested to ensure they work correctly with Windows 10."

In the past, we've allowed two months for this process. In this instance we're trying to do the work in two weeks. That gives you some idea of the pressure my engineers are under right now."

Some devices were already on shelves for the launch last month, but most will likely arrive in September and October – possibly just missing the key back-to-

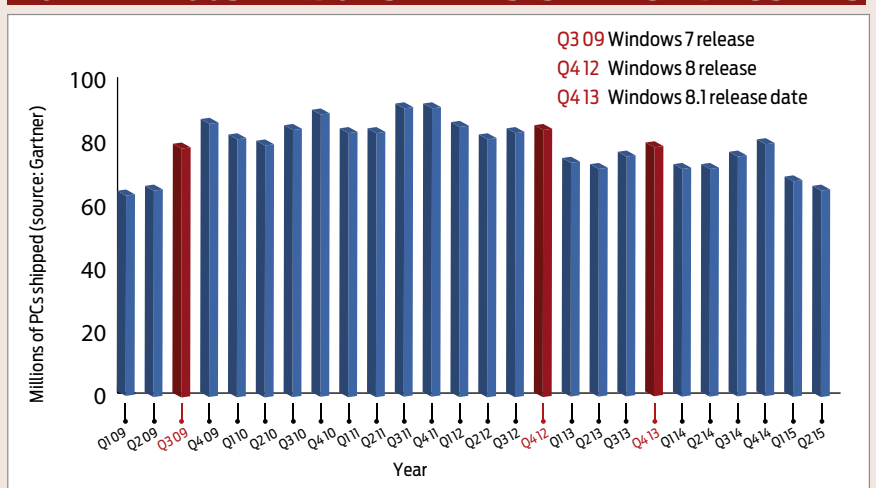
school period. However, the hardware already on shelves isn't headed to the rubbish tip.

"Retailers and e-tailers can continue to promote existing devices and inform end users about the free upgrade opportunity as promoted by Microsoft under the motto 'buy one, get (Windows) 10 free,'" Labesque said. "For companies that require testing, the promotion and focus

will be in the autumn, giving hardware vendors more time."

Despite the lack of a bump to their bottom lines, Roberts and Furby both welcomed the new OS, saying the Start button, virtual desktops and other new features will help encourage users to make the switch. "I predict business adoption from 7 to 10 will be a lot faster than XP to 7 – but that's just a prediction," Furby said. ●

## HOW PREVIOUS WINDOWS RELEASES AFFECTED PC SALES



# GAMING NEWS

We're not playing around, here...

## BLIZZARD REVEALS WORLD OF WARCRAFT: LEGION

*More levels, a new class, and a new zone, in WoW's latest expansion*

**B**lizzard normally reveals its big expansions at Blizzcon, but this year the WoW-meister has lifted the lid on the next part of the World of Warcraft journey at Gamescom, in Cologne, Germany. There's no release date set, but we can tell you that the new expansion is simply named... Legion.

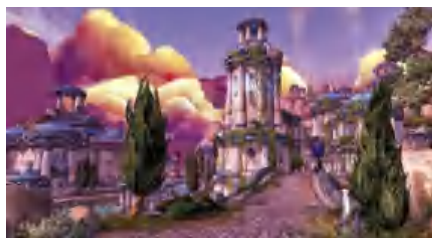
Yes, it's all demons, all the time, and this expansion will not only boost the level cap up to a crazy 110, but it also brings in a whole new class, the Demon Hunter. This demonic powered PC is perfect for taking on the Burning Legion, and can use abilities to dodge, close with their enemies, and even use Spectral Sight to let them detect hidden targets. They can focus on either Havoc, and be

damage dealers, or can just tank with the Vengeance spec.

They also start out as Hero characters, like Death Knights.

Taking a leaf out of Lord of the Rings Online, Legion also offers every player with a personal Artifact, a weapon that levels and can be customised to suit your hero. Legion also introduces the Broken Isles, a new location where players can puzzle out the location of the Pillars of Creation, and even explore the twisted Emerald Nightmare.

The expansion also adds a new Honour system to PvP, and Legion even lets you boost a single character to level 100, so you can catch up on the new content right away.



BATTLETECH PC  
STRATEGY GAME  
COMING TO  
KICKSTARTER  
THIS YEAR

*Mech stomping action  
is coming back to PC!*

While the original Baldur's Gate game was released over a decade ago and the term expansion pack nowadays seems more-or-less reserved for the latest add-ons to The Sims, Baldur's Gate: Enhanced Edition developers Beamdog have decided to simultaneously breathe new life into the now iconic role-playing game and reclaim the term 'expansion pack' by releasing a massive package of brand new content for the game.

The expansion pack, which will only work with the Enhanced Edition re-release from 2012, is titled the Siege of Dragonspear and is set add around 25 hours' worth of story and gameplay, filling the gap between the first two entries in the series, as well as a brand new class called the shaman, four additional companions, and a revamped user-interface. Though there was no listed release date at the time of writing, it won't take much convincing to get us back into the world of the Forgotten Realms.

## VR GAME POLLEN IS COMING TO PC EARLY NEXT YEAR

*Hard to type, but this science fiction sounds remarkably intriguing*

**G**iven that it's meant to be inspired by sci-fi classics like Solaris and 2001: A Space Odyssey... we'll forgive the developers, Mindfield Games, for the odd and vaguely annoying name. The game's FAQ alludes to bees, somehow, but is short on detail.



The game, due out in early 2016, is built from the ground up as a "virtual reality exploration game", where the players step into the space-boots of a mechanic working for Rama Industries on Saturn's moon, Titan. There, he and four others must work to uncover an unknown object at research station M, hidden below the moon's crust.

Expect many secrets to be discovered, and many moody moments of bouncing around in a space-suit.

"P.O.L.L.E.N is a new breed of exploration and storytelling in games", said Olli Sinema, Co-founder of Mindfield Games, in today's release. "Virtual reality is about freedom to do



whatever you like and everything in the game world has been made interactive for the player to experiment with. All the objects can be examined or operated - just like in real-life and it's the player actions which define how they uncover what has happened in Research Station M".

P.O.L.L.E.N. will be available for HTC Vive, OSVR, and Oculus Rift. A later version will also work on the PS4 Morpheus.

The scant few 100% native VR games in development makes this one particularly exciting.



# msi®



# Z170A GAMING M7

## Subvert Your Imagination

DDR4-3400[OC]



TWIN-TURBO M.2



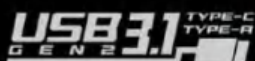
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# CHIP NEWS

Is AMD building a Zeppelin to take on the Skylake? An 18 year old vulnerability leaves Intel processors flawed, and AMD users unlock even more Fury. **Mark Williams** covers the latest in chip news.

## CPU

### AMD'S ZEPPELIN

A recent leak detailed a future AMD server grade APU designed as an "Exascale Heterogeneous Processor", codenamed Zeppelin.

The leak shows that the Multi Chip Module will have Zen based CPU cores and be paired with a HBM touting Greenland GPU rated at over 4 TFLOPS all sitting on top of a "Coherent Data Fabric" linking the CPU and GPU together, avoiding PCI-E latency and bandwidth contention.

Also shown in the leak was the fact that the Zeppelin cores will support a quad channel DDR4 sub-system rated at 100GB/s, which is also the speed rating of the Coherent Data Fabric link between the CPU and GPU on the module.

### MEMORY SINKHOLE IN X86

At the recent Black Hat convention at Las Vegas in the USA (where hackers and security experts come together

to show off and find exploits and vulnerabilities), a zero day exploit proof of concept was revealed showing that due to a flaw in the x86 architecture an attacker could gain privileged secure access on the processor that even the operating system doesn't know about it, showing that it's possible to inject malicious code that runs at the firmware level where even anti-virus software can't touch.

To understand the flaw better we need to talk about so called 'rings'. A ring is a security level in the processor where certain privileges are given that allow tasks to access data and processes within lower security rings, but not higher ones. The operating system runs at ring 0 and was the highest level for a long time until more advanced features later came about which spawned even higher 'negative' rings.

Above ring 0 is ring -1 which is where you'll see virtualisation tasks being

handled, and above that is ring -2 where cryptography, firmware, SecureBoot signatures etc all operate. This highest level ring -2 is what this attack targets thanks to a compatibility feature in Intel's Local Advanced Programmable Interrupt Controller (or LAPIC) allowing the attacker to remap LAPIC's address space, creating what has been dubbed a 'memory sinkhole' allowing malicious code to be injected for such things as deeply persistent rootkits.

Fortunately it is very hard to pull off this attack. Unfortunately it affects all Intel processors from the original Pentium right through to 2nd gen Core CPUs (Sandy Bridge).

BIOS updates patching this vulnerability is one way affected systems can be secured, but the chances of it happening on old motherboards is very slim. It's unknown at this stage if AMD platforms are affected as well.

## GPU

### UNLOCKING THE FURY

A user over on Overclock.net has created some software called CUINFO that allows R9 Fury (non X) owners to see exactly which compute units (CUs) are disabled on their cards.

Not all Fury cards are equal. Fury X GPUs that have one or more defects amongst its 4096 shaders during manufacture will have eight of its CUs (512 shaders) disabled and be repurposed to fit the Fury (non X) specification of 3584 shaders. However silicon defects are random, and often less than eight CUs are actually faulty, meaning AMD has to disable some functional CUs to meet the Fury (non X) specification.

With some having working CUs simply disabled via firmware and not laser cut to permanently disable the units, these cards can theoretically unlock once again these functional CUs by flashing the cards with a custom BIOS.

And it works! With some users reporting that they can unlock an extra four CUs (256 shaders) for 3840 shaders

total with no adverse effects regarding clock speeds or graphical glitches.

One very lucky user was even able to unlock the full eight CUs, turning the card into a fully-fledged Fury X.

Performance gains of Fury's with 3840 shaders show a 1-5% performance boost over standard Fury's.

Fury owners considering doing this should be careful, however, as it will void your warranty and may leave you with a non-functioning card if the BIOS update goes wrong.

### GTX 950 VS R7 370X

The next battle between Nvidia and AMD is in the lower mid ranges of their product line-ups where Nvidia's GTX 950 is expected to face AMD's R7 370X.

The GTX 950 on the memory front is expected to be similar to the GTX 960 with a 128bit bus and 2GB of VRAM, while the CUDA core count is cut down from 1024 to 768. Clock speeds should be similar as well, however the TDP is set to be 90W, 30W less than the GTX 960 and 30W above the GTX 750 Ti.

The R7 370X unfortunately appears to be another rebrand, being the R9 270X in all but name. With 1280 shaders and 2GB of VRAM on a 256-bit bus will it be enough to hold off Nvidia's newer technology? Time will tell. The GTX 950 is expected to launch within weeks.

✓ Do you own a regular AMD Fury card?  
You may be able to turn it into a full Fury X!





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# MOST WANTED

**Rob North's** delves into this month's wonderfully weird and weirdly wonderful tech

## Phillips Fidelio B5 Soundbar

Phillips' Fidelio B5 takes the form factor of a soundbar and packs in a whole bunch of extra features to make it one of the most versatile soundbars currently on the market.

### **MOST WANTED:**

Following its predecessor, the Fidelio HTL9100, Phillips' latest offering has two detachable wireless modules on either end of the bar that can be used to create a surround sound set-up regardless of where you place them in the room thanks to a new calibration algorithm. Alternatively, you can also independently pair the detachable modules via Bluetooth.

### **NOT WANTED:**

While some people might appreciate the Fidelio B5's aluminium finished centre piece, we personally prefer a soundbar that's heard rather than seen, and would have liked to see a discrete all-black model.

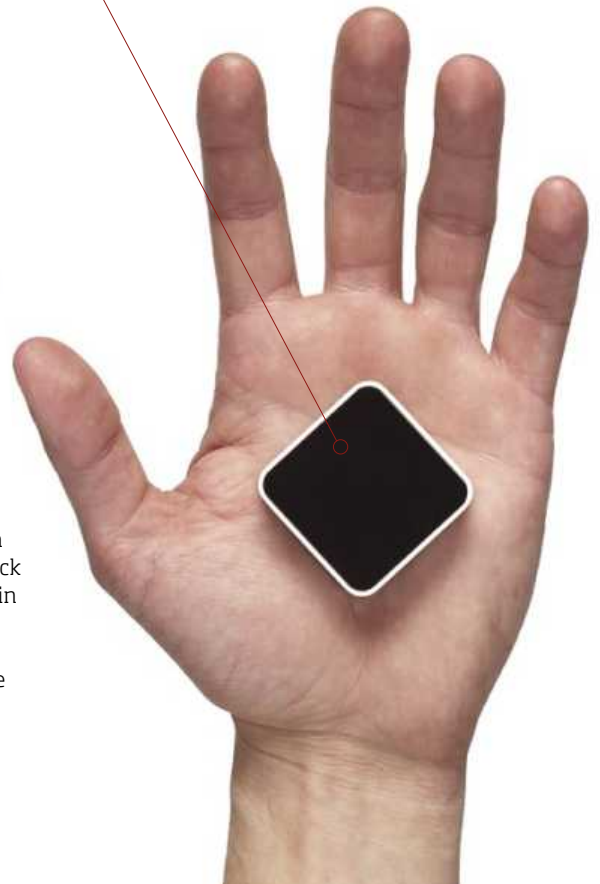


## Density

What if you could tell exactly when your local café was quiet, so you could duck in and grab a table or get your coffee queue-free? I'm not talking the Google Search style 'Popular Times' either - I mean up-to-the-minute foot traffic! Well, that's where the inconspicuous Density sensor and accompanying app come in.

**MOST WANTED:** Positioned near an entrance, the Density sensor lets businesses see just how busy they are in real time, and for the rest of us it shows us exactly when we can head in to avoid crowds. And best of all for those out there interested in maintaining just a shred of privacy, as it's simply an infrared sensor there's no personally identifiable information collected!

**NOT WANTED:** Given that it's up to the businesses to purchase and install it, Density's usefulness to customers will depend on whether or not your favourite locations decide to take it up.



## EK-Predator AIO

Bringing their experience developing high-end custom loop parts to an out-of-box solution, EK Water Blocks are launching their expandable, all-in-one Predator range, and it's as cool as it is cooling.

**MOST WANTED:** The EK-Predator comes pre-filled and preassembled in both 240mm and 360mm versions, with the usual G1/4 ports for expansion, and Quick Disconnects on the 360mm version to allow expansion without needing to drain the unit.

**NOT WANTED:** There will only be support for Intel CPUs on release, so those with an AMD chipsets will have to wait until 2016. You'll also need to make sure you can fit these bad boys into your case, with the Predator 240 radiator with integrated pump and reservoir measuring 295mm x 133mm x 68mm while the Predator 360 measuring 415mm x 133mm x 68mm.



## Bevel

Following the success of their crowdfunded low-cost USD\$650 3D scanner, Canadian company Matter and Form is aiming to provide an even cheaper option with Bevel – a USD\$49 smartphone attachment that lets you capture 360 degree digital models of people, places and things.

**MOST WANTED:** Compatible with both Android and iOS, Bevel plugs into the audio jack of your device and acts just like a regular camera – all you need to do is point and shoot, and bam, you have a 3D model that can be turned into a GIF or saved for 3D printing.

**NOT WANTED:** We wouldn't expect this to replace your existing 3D scanner if you have one, especially given the mediocre quality of the 3D models showcased in the Kickstarter campaign promo video, but at such a low price point it's a pretty cool and certainly most wanted gadget.



## Corsair Strafe RGB Silent

While for many productive typists and gamers alike the constant click-clack of a mechanical keyboard is a soothing audible reminder that you've ascended to a higher plane of existence (and in all likelihood a higher tax threshold given their relatively exorbitant price tags), you've probably been unwittingly testing the patience of those around you for quite some time. Fortunately, thanks to Cherry and Corsair, silent switches are just around the corner.

**MOST WANTED:** Corsair's Strafe RGB Silent will be the first keyboard to feature the new Cherry MX Silent switches, with an integrated two-component tappet providing a much quieter experience. The keyboard itself isn't too shabby either, with separate contoured keycap sets for FPS and MOBAs – you can also set custom RGB lighting to highlight your frequent keys.

**NOT WANTED:** We're splitting hairs here, but if replacing keycaps is your thing, Corsair continues to use a non-standard bottom row.



## Pavlok

Featuring an unparalleled shock-and-awe factor, Pavlok is a wristband wearable designed to help you curb bad habits and fulfil your masochistic desires. How does it do this, you ask? Oh, just by zapping you with a small electric shock each and every time you slip up, of course!

**MOST WANTED:** Pavlok is pretty neat, and looks great considering it's basically a human shock-collar. Hooked up to a companion smartphone app, it's great at dishing out positive punishment when it comes to location-based goals like going to the gym (or failing to, rather). Plus, if you're not keen on being shocked, you can instead set the device to automatically post your failures on Facebook or to extract money from your bank account.

**NOT WANTED:** Unfortunately when it comes to habits your smartphone can't track, like giving up ciggies or not dieting, Pavlok is shockingly average – you'll need to manually shock yourself.



## SanDisk Connect Wireless Stick

Connecting to devices via a built-in Wi-Fi hotspot, the Connect Wireless Stick from veteran flash storage manufacturer SanDisk is a decent storage and media streaming solution particularly for mobile devices.

**MOST WANTED:** You can of course use the wireless stick to store and access all sorts of extra files, but the big draw card is the ability to stream music or videos across three devices simultaneously. Parents with long car trips ahead, rejoice.

**NOT WANTED:** But if you haven't got any holiday plans with the kids, and you're not going to be out of range of internet access for long periods of time, we can't really see what benefit this device has over a cloud storage service. Oh, and the physical connection for PCs is USB 2.0 rather than 3.0.

# AVOIDING CLOUD DISASTERS

**Anthony Caruana** on how to assess the best cloud providers

**R**egular reader Philip Dawson has written in, following up on our recent story on cloud services. In particular, he's concerned about cloud services that offer plenty but disappear leaving you high and dry.

"Your article about cloud disasters is timely, but you didn't actually say much about the main players and how safe they were. I had a free Adobe account with "workspaces" where you could upload pdfs, then a year ago got an email it was closing. Telstra offered a free T Cloud account with my phone, it too is closing. My Asus netbook, and newer Asus Ultrabook offer free cloud storage, my Acer tablet also offers cloud storage. Flickr offers a free Terabyte for photos, there are a confusing array of options! Since I have a couple of Windows 8 machines and several copies of office at home and work I have a large free allocation on OneDrive, and since I have Dropbox installed on a number of machines I also get 50GB free there too.

So I don't rely on Cloud Storage, just find them convenient to access my stuff from anywhere so I don't need to set up and maintain my own accessible cloud NAS. I have all my stuff backed up on two large hard drives on my PC, and three attached external hard drives, one which is attached to the router for network access. A portable 1.5 TB Seagate Go Flex goes with me and has nearly everything on it."

When considering cloud storage services, we always start from the same premise. Take the word "cloud" out of the equation and replace it with "someone else's computer". Would you trust your data to someone else?

Concentrating on cloud storage



## Anthony Caruana

*has worked for almost every major masthead in the Australian IT press. As an experienced IT professional – having worked as the lead IT executive in several businesses, he brings a unique insight to his reporting of IT for both businesses and consumers.*

services, when choosing where we put our data, we don't start with the spec sheet. While capacity and performance are important, the reputation and reliability of the service provider are paramount. A fast, high capacity service that's delivered by someone without a track record of delivering services can be a recipe for disaster when it comes to your data.

It pays to delve under the covers a little. Many cloud storage providers rely on third parties to provide the physical infrastructure your data actually resides on. For example, when you look at Dropbox you discover they use Amazon's S3 service for storage. Their secret sauce isn't a massive bank of storage devices – it's the software they've created to keep your data in sync.

That means your concerns aren't likely to be about the storage media – even the location is less of a concern now that Amazon has local data centres in Australia. Your concerns are going to be around the reputation of the company.

With all the offers of free storage, the trouble is most people don't plan their storage strategy and just dump data into cloud services or onto external drives. Philip is definitely on the right track in using a combination of local storage and cloud services.

Work out how much capacity you need, where you need to access your data and put in place a plan for that suits your needs. That includes backups and archives as well as day to day data.

When choosing a cloud storage service, we'd evaluate the contenders by asking the following questions.

**1.** How long has the provider been operating? Don't risk putting important data with a new, unproven provider.

**2.** What do user reviews say? In particular, pay attention to reviews from users who have been on the service for several months. Many services look good in the first couple of days but reliability and performance are measured over months, not days.

**3.** Who is providing their data storage? This might be a little harder to find but is important. Operating infrastructure at scale is a specialised capability that takes particular skills and resources.

**4.** Who can access your data? If you're storing sensitive data find out what sort of encryption is being used who has access to the encryption keys.

**5.** Have there been any security breaches reported? With this it's important to put things into context. If there has been a breach, look into the details. Was any unencrypted data lost? How long ago was the breach? What action was taken? How long did it take for the provider to disclose to its customers that there had been a problem?

Armed with those answers, you'll be well on the way to choose a cloud storage provider that meets your needs.

**NEED HELP? EVER HAD AN ISSUE AS A CONSUMER? INVESTIGATOR CAN HELP.**

If you've had an issue or had something happen and you think investigator could help, email your problem to [investigator@pcandtechauthority.com.au](mailto:investigator@pcandtechauthority.com.au)





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# SUPERIOR STREAMS:

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*the hi-def  
alternatives  
to Spotify*

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YOU DON'T HAVE TO PUT UP WITH THE SO-SO STREAMING QUALITY OF SPOTIFY MP3S. **BEN PITT** COMPARES THE MARKET LEADER WITH FIVE OTHER SERVICES – INCLUDING SOME OFFERING LOSSLESS, HIGH-DEFINITION AUDIO – TO FIND OUT WHICH IS THE BEST, AND EXPLAINS WHAT EQUIPMENT YOU'LL NEED TO HEAR THE DIFFERENCE



# High-quality streams: What difference do they make?

Digital audio quality was a contentious issue long before MP3 came along, and the debate will probably rumble on forever. On the one hand, there are people who describe MP3 as unbearable and insist it is destroying music as we know it. Then there are a far greater number of people who quite happily listen to compressed music on their PCs, portable players, YouTube, DAB radios and Bluetooth car systems. It's hard to navigate this issue without sounding like a sanctimonious snob or a cloth-eared philistine, so we'll have a go at upsetting everyone equally.

## INSIDE THE SPECS

Digital audio has three key specifications: sample rate, bit depth and bit rate. The sample rate sets the maximum frequency that can be represented. Two samples are required for the high and low points of an audio wave, so CD audio's 44.1KHz sample rate gives a theoretical maximum frequency of 22.05KHz. Human hearing is widely accepted to be 20Hz to 20KHz.

The bit depth dictates the precision of the waveform's volume for each sample, and thus the range of volumes that can be captured, known as the dynamic range. 16-bit data has 65,536 possible values, giving a dynamic range of 96dB; 24-bit audio has 16.7 million values and a dynamic range of 144dB.

Humans can perceive a massive dynamic range – the difference between the quietest detectable whisper and a volume that causes permanent damage is around 140dB. However, people can't discern both simultaneously. Besides, most people don't listen to music at ear-splitting volumes. This is the rationale behind CD and most other distribution formats that use 16-bit audio.

The bit rate is the amount of data that's used to store this information. CD audio at 44.1KHz, 16-bit comes in at 1,411Kbits/sec, but this can be reduced to around 900Kbits/sec using lossless compression such as FLAC. This is similar to a ZIP file, in that the data can be recovered to its full integrity. A 50-minute, CD-quality FLAC album weighs in at around 350MB.

Lossy audio compression such as MP3, AAC and WMA reduces file sizes further by dispensing with elements that the listener

(hopefully) won't miss. A 50-minute album of 128Kbits/sec MP3s consumes only 50MB. However, the changes to the waveform can't be reversed.

These formats are similar to JPEG images in that, with sufficient data bandwidth, the changes are hard to spot. However, if you compress a JPEG too heavily, graduated colours become banded, subtle textures look smudged and sharp lines have a messy digital fuzz around them. The same characteristics are broadly true of low-bit-rate MP3 files. High frequencies become scratchy and metallic, quieter frequencies sound smeary, and the sharp attacks at beginnings of notes, known as transients, become woolly.

The obvious solution is to use a suitably high bit rate. However, unlike JPEG images,

*“The testers weren't left with the impression that there's anything wrong with CD audio”*

most MP3 and other compressed audio files are encoded at a fixed bit rate, so the encoder has to work within its means. Variable bit rate (VBR) encoding increases the bit rate dynamically as necessary, but it's impossible to avoid compression artefacts completely.

Lossy audio compression reduces the data requirements by discarding frequencies that are masked by other nearby, louder frequencies. However, before it can do this, the audio must be converted from a single continuous waveform into a map of frequencies as they change over time – a process known as a fast Fourier transform (FFT). Performing an FFT will introduce errors, regardless of the bit rate used, because the audio is chopped up into discrete blocks of a few milliseconds. Shorter blocks are used to improve timing accuracy when a transient is detected, but this reduces the accuracy of the frequency detection. All this is before frequencies are selectively discarded to reduce the data requirements. So, on paper, lossy audio compression can only produce an approximation of the original.

## SHOULD YOU CARE?

The vast majority of people are untroubled by audio compression. However, once your ears are tuned to spotting compression artefacts, it becomes harder to ignore them.

We conducted blind listening tests using a range of listening equipment: a studio recording setup featuring a Focusrite Saffire Pro 40 audio interface and ESI Near08 studio monitors; a Sony NWZ-ZX1 premium portable audio player and Sony MDR-1A headphones; a pair of Sonos Play:1 speakers; an entry-level Onkyo amplifier and Q Acoustics 2010i speakers; and finally a Pioneer FH-X720BT car stereo wired up to the original Vauxhall speakers. We tested with a variety of music tracks and in all the formats offered by the streaming services mentioned in this article. We also subjected the tests to casual music fans, a musician and a dubbing mixer.

One result was consistent across all the criteria: 96Kbits/sec MP3s, as used by Spotify Free, were quickly recognised as sounding worse than everything else. Even the car engine noise failed to hide the metallic swirls and woolly transients.

Our testers were usually able to identify CD-quality lossless audio from high-bit-rate lossy streams. These results weren't consistent, though. Some tracks showed a bigger difference than others, with noisy and percussive music revealing compression artefacts more clearly. Listener fatigue and confusion set in quickly, however, and accuracy of identification fell after a couple of minutes' careful listening. We'd conclude that the difference between lossy and lossless audio is evident to most people, but it's not clear-cut.

Comparing MP3 at 320Kbits/sec, AAC at 256Kbits/sec and WMA at 256Kbits/sec produced no clear winners or losers, but MP3 fared slightly worse than the others in blind tests – possibly because it's an older, less sophisticated codec. However, the lack of agreement among our testers means we wouldn't recommend one service over another simply based on the choice of lossy streaming format.

It's clearly a complex – and perhaps subjective – issue, so you may want to perform your own tests. Qobuz sells individual tracks that can be downloaded

in a range of formats for A/B testing. However, if you're happy with compressed music and don't want to pay for lossless streaming, perhaps it's best to carry on as you are.

Also, bear in mind that portable device storage capacity might be a bottleneck. Our collection of 355 albums in FLAC format comes to 107GB, which wouldn't fit on a smartphone or tablet. The same collection as 256Kbits/sec AAC files would be a more manageable 27GB.

## BEYOND CD-QUALITY

We've explained why 44.1KHz, 16-bit was chosen for the CD format, but not everyone is convinced. The counter-argument made by the likes of Neil Young and his company PonoMusic is that you need a digital system that comfortably exceeds human hearing in order to avoid quantisation error (where values are rounded up or down), removing any chance of the distribution format perceptibly degrading audio quality.

Audio is routinely recorded at 24-bit and processed at 32- or 64-bit to minimise the cumulative effects of quantisation as audio is passed through long processing chains. As a result, studio master recordings are invariably 24-bit or higher. So, why not distribute them in 24-bit? It's only a 50% data increase for a substantial boost to the dynamic range.

A 44.1KHz sample rate is still the norm for recording, but 96KHz and 192KHz are increasingly common. These extra frequencies are theoretically beyond

> Play:1 speakers and MDR-1A headphones were used in testing

human hearing, but the proof of the pudding is in the eating.

Our Focusrite studio interface and the Sony NWZ-ZX1 are both capable of 24-bit, 96KHz playback, with the ZX1 going up to 192KHz. We used these to compare high-resolution downloads from Qobuz with CD-quality downloads of the same tracks. We also generated 16/96 and 24/44.1 copies in Sony Sound Forge in order to properly isolate the effects of higher sample rates and bit depths.

Differentiating between 24-bit and 16-bit versions of pop music proved impossible. If other people can spot the difference, good luck to them. For classical music, where there tends to be a much larger dynamic range, some listeners were able to identify the 24-bit version in the quieter passages of music, citing an increased sense of space and depth to the recording. It took multiple A/B comparisons to identify the 24-bit mixes, though, and there were quite a few wrong diagnoses.

While the difference was still extremely subtle between 44.1KHz and 96KHz versions, our testers were able to identify these more confidently; there was a hint of

extra sparkle and precision in the high frequencies. The testers weren't left with the impression that there's anything wrong with CD-quality – it was simply that 24/96 has a dash of extra detail.

In the course of testing, we converted high-resolution mixes to 44.1KHz using Sound Forge's Save As command, rather than its sample-rate conversion plugin. This produced a far more noticeable degradation of high frequencies. We'd like to think that CD-quality masters are prepared more carefully than this, but no doubt there are exceptions. It's probable that high-resolution music is prepared for distribution with more care than CD-quality formats, which may be a reason in itself to choose it.



# Our verdict

PROVIDERS WILL LIKELY LEAPFROG EACH OTHER WITH FEATURES AND DISCOUNTS IN THE COMING MONTHS. THANKFULLY, IT'S EASY TO SWITCH

Until recently, music-subscription services felt like an experiment. Would audiences take to the concept? Would labels and artists allow it? Napster and Spotify blazed the trail, but we suspect it will be Apple Music that takes it mainstream – as long as Apple can fix the uncharacteristically sluggish and disjointed iOS app.

Conceptually, it's all there, with a comprehensive suite of services at competitive prices. It's just missing the effortlessly simple interface that Apple is (or, at least, was) renowned for. There's a generous three-month trial, but we'd be tempted to wait a little longer for Android support before using it if you're not an iPhone owner.

In the meantime, Spotify is still a credible option thanks to its comprehensive hardware support. It

wouldn't be our first choice for new subscribers, though. Google Play Music is generally similar, but its integrated download store and cloud-based hosting of your own music library make it a one-stop shop for music playback. Apple Music offers the same services, but Google comes out on top, with Android, Sonos and web support and a more polished iOS app. If Google add lossless streaming, it would be the clear winner.

This specification puts Tidal out in front for those who demand CD-quality music. Its lossless streaming services are twice as expensive as the packages based on lossy compression, and the larger FLAC files fill up portable devices more quickly, but we think it's worth taking the hit if you're serious about your quality. Tidal feels more fresh and relevant, and its interface is the best.

The landscape is changing rapidly, and we expect to see providers leapfrogging each other with features and discounts in the coming months.

There's no need to fret about the future, though. One of the perks of subscription services is the ease with which you can switch providers. It's even possible to migrate your own playlists via [soundiiz.com](http://soundiiz.com).

Subscription services aren't for everyone. If you prefer to own rather than rent your music library, Amazon provides a convenient way to do so with its CD sales and AutoRip feature, giving the immediacy of downloads and streaming with the lossless quality and permanence of a physical CD.

Then again, if there's one thing we predict a limited shelf life for, it's the venerable CD. ●

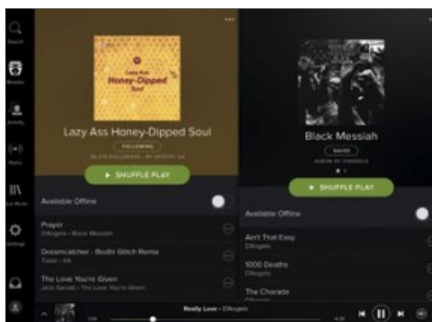
# Spotify

Spotify is the market leader for streaming music, largely thanks to its “freemium” business model, which draws people in with a free, limited service before converting (some of) them into paying customers.

The free version of Spotify is restricted to 96Kbits/sec MP3s interspersed with ads, and it offers only limited smartphone features, but it's okay for occasional use – perhaps to check out an album before buying elsewhere.

Spotify Premium costs \$11.99 per month (until October 5th), removes the ads and other playback restrictions and raises the bit rate to 320Kbits/sec. Additional family members can be added for \$6 each, which makes the price for a family of five – \$36 – twice as expensive as Apple Music's Family Pack. A multi-room Sonos system can run off an \$11.99 subscription but, unlike the other services here, streaming to Sonos prevents simultaneous playback on other hardware.

Spotify makes it easy to discover new music. Users can broadcast their activity on Facebook and



Twitter, follow each other, send messages and share and collaborate on playlists. The Related Artists and Artist Radio features generate recommendations, and there are curated playlists too.

We were sorry to see the demise recently of Spotify Apps, whereby third parties presented album reviews alongside playback of the music in question. However, the benefit is a consistent interface across the web



player, desktop application and apps for Android, iOS, Windows Phone and various other platforms. There's currently no touch-centric app for Windows.

Spotify's popularity has yielded wide-ranging hardware support. The list currently includes Sonos,

< Spotify supports a wide range of hardware, including Sonos, Roku, PlayStation and Squeezebox

Roku, Samsung smart TVs, Logitech Squeezebox, and PlayStation consoles. Spotify Connect allows music to be streamed directly to various AV receivers and speakers from Onkyo, Panasonic, Yamaha, Pioneer, Sony and others, via the desktop, iOS or Android app.

Spotify has come in for criticism for how much it pays artists (or, more accurately, labels, who are responsible for paying artists). There are some significant omissions from the catalogue as a result, including Taylor Swift, The Beatles and AC/DC, and major releases often arrive late to its servers. Rival services have similar gaps, but Spotify suffers more because the service doesn't integrate purchases into the same play er.

With streaming quality limited to 320Kbits/sec MP3s and a relatively high price, there are better deals. Still, the extensive hardware support and excellent music discovery keep it in the running.

## OVERALL



# Amazon Music

Amazon Music was set to be the odd one out in this roundup, being the only service not to offer a subscription-based streaming service in Australia. Then, just as we were heading to press, the company unveiled Amazon Prime Music – a catalogue of one million songs available to US\$99-per-year Prime subscribers.

One million tracks might sound like a huge library, but it's abject in comparison to rival streamers. Household names such as U2, Adele, Oasis, Bon Jovi and Bruce Springsteen are all absent from the streaming catalogue.

The site design's a car crash, too. It feels like streaming's just been bolted onto the Amazon store. Tracks or albums have to be added to your library before you can play them; you can't just search and stream. At first inspection, it needs a lot of work.

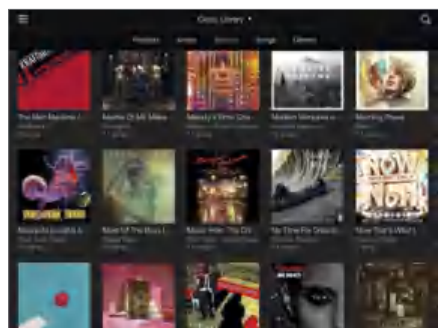
However, Amazon offers a unique feature that more than warrants its inclusion in this test, namely AutoRip, which provides MP3 streams and downloads of CDs purchased on Amazon. This



service was introduced in 2013, but our CD purchases dating back to 2006 were visible in the Cloud Player. This means CD shoppers get the convenience of cloud streaming, while MP3 shoppers receive a lossless backup through their letterbox. Bizarrely, Amazon CDs with AutoRip are often cheaper than the MP3 album, although there's now a \$40 minimum spend to qualify for free delivery.

The store also sells standalone MP3s encoded with a variable bit rate, usually between 200Kbits/sec and 300Kbits/sec. Purchased music can be streamed using a web browser, Android and iOS apps or Sonos speakers, and up to ten devices can be used simultaneously.

Amazon's cloud streaming service can also host music bought elsewhere. Up to 250 tracks can be uploaded for free, while 250,000 tracks will cost \$44 per year. A Windows utility handles the uploads, and tracks that match Amazon's existing library needn't be uploaded. This provides a sneaky way to upgrade the quality of an MP3 library; we offered it a 64Kbits/



^ Amazon's streaming service can be used to upgrade the quality of existing MP3s

sec copy of a song and it provided us with a 282Kbits/sec copy for streaming and download.

If you prefer to purchase your music collection outright, rather than rent it, Amazon delivers a compelling combination of convenience, quality and overall value.

However, don't be fooled into thinking Prime Music is a genuine rival to Spotify and co.

## OVERALL





# CHOOSE THE BEST

## ASUS Z170 SERIES MOTHERBOARDS

UNLEASH THE INTEL 6<sup>TH</sup> GENERATION CORE



### Game better with the ASUS Republic of Gamers (ROG) and ASUS Pro Gaming

Between the ASUS Republic of Gamers (ROG) and ASUS Pro Gaming, there is a gaming orientated solution for all levels of competitive and casual gamers. Delivering exceptional gaming audio, powerful performance tuning and exclusive gaming advantages, it's your time to shine!

- OC Champion's Top Pick (iROG + Pro Clock + Extreme Engine DIGI+ + OC Panel II)
- 6.5X Better BCLK O.C. Range without Limits (TPU + Asus Pro Clock)
- Latest and Fastest I/O (Thunderbolt™ 3, USB 3.1 Type A/C, Ultra M.2 (32Gb/s), U.2 & RAM Cache)
- Perfect Fusion of Professional Hi-Fi & Gaming Audio (SupremeFX)
- Exclusive Gaming Advantage (KeyBot II & SonicRadar II)
- Gaming Optimised Networking (Intel LAN + GameFirst)

Gearing up for boundary breaking performance? Go no further and check out the stunning ROG Maximus VIII Extreme! Looking for a value-packed gaming focused motherboard that won't break the budget? The ASUS Z170-Pro Gaming motherboard has your back. Whether you want a full-sized ATX motherboard like the ROG Maximus VIII Hero or a small form factor ready Mini-ITX motherboard like the Z170i-Pro Gaming, the ASUS gaming range has a solution to meet your needs.

It's time to take your gaming to the next level with ASUS Z170 gaming motherboards!



# Apple Music

Anything Apple does is big news, but the recent launch of Apple Music could prove to be a defining moment. Spotify always seemed slightly vulnerable to a backlash from artists, but the emergence of Apple Music certainly means subscription-based streaming is here to stay.

It launched with much fanfare alongside Beats 1, an internet radio station fronted by DJ Zane Lowe, who was poached from Radio 1. The first impressions of Beats 1 are positive, with minimal advertising and a playlist of experimental music rather than the usual chart-toppers.

For \$11.99 a month, you get unlimited access to streamed music in AAC format at 256Kbits/sec for iOS 8.4 devices and Macs and PCs running iTunes. This includes offline playback, and an Android app and Sonos support are promised for later this year.

Family Sharing costs \$17.99 a month and allows five additional Apple IDs to be added. All six users can make purchases from the same credit card – presumably in an attempt to stop

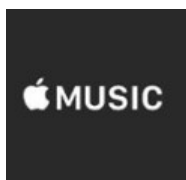
people sharing subscriptions with friends – although there's an Ask To Buy feature that stops under-18s spending without prior approval. Expect family arguments when the kids turn 18.

iTunes Match hosts up to 25,000 songs from your own music library in the cloud for \$34 per year, but it's included free with an Apple Music subscription. There's no need to upload songs already on Apple's servers, and you get 256Kbits/sec AAC streaming regardless of the quality of the original files.

Our iTunes library appeared impressively quickly in the Apple Music iPad app, although iTunes gave up halfway through uploading unmatched songs and we couldn't persuade it to resume.

The iOS app integrates subscription-based streaming, iTunes Match, locally stored music, iTunes Store purchases, and

Beats 1 and other radio stations. The curated content is excellent, providing easy ways to express preferences, as well as some superb playlists. There's also a feature called Connect, which functions like Twitter for artists.



^ Teething problems aside, Apple Music shows a lot of promise

The integration of the various features feels incomplete, though, and Apple has missed various opportunities. For one, you can't jump from a song to the artist's page (unlike on Spotify). The app was unresponsive on our third-generation iPad and some buttons didn't work at all.

We'd wait for Android and Sonos support, and a better-behaved app, but Apple Music shows considerable promise, especially when you consider the Family Sharing deal.

OVERALL



# Google Play Music

Google Play Music offers the full gamut of digital music services: subscription-based streaming from its library of 30 million tracks; a download shop; and cloud storage and streaming for purchased tracks and up to 50,000 more from your own music library.

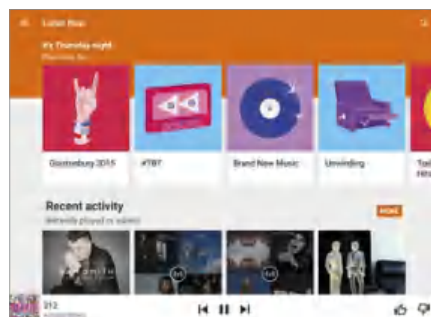
The unlimited streaming service is unremarkable. It costs \$11.99 per month and streams 320Kbits/sec MP3s, but there's no discount for multiple family members. The editorial content has recently been revamped to include curated playlists – we were treated to ones to get us in the mood for writing this feature, boost our energy and help us focus on work. These are free in the US (interspersed with ads), but currently available only to paying subscribers in Australia.

There's not much to report about the download store. It uses the same 320Kbits/sec MP3 format, and its prices are similar to those on iTunes and Amazon (although buying physical CDs from Amazon often works out cheaper).



Play Music's most noteworthy feature is that its cloud storage of 50,000 tracks is provided for free, regardless of whether you take out a \$11.99 monthly subscription. Music files and folders are dropped directly into the browser, or you can use the PC utility that looks for new tracks added to your computer and uploads them automatically. Music that matches online equivalents isn't actually uploaded, although it may as well be for the amount of time it takes. We were able to upload FLAC tracks that weren't already in Google's library, but these were converted to 320Kbits/sec for streaming and download.

Playback for all three services is integrated in a web player, apps for iOS and Android, and a Sonos service. The mobile apps allow downloads for offline playback. The Android app – which is the standard Play Music app that comes preinstalled on handsets – integrates any other music stored on the device. Subscription content that's



^ Play Music allows you to host 50,000 of your own tracks for free

downloaded for offline playback is – understandably – stored in an encrypted folder, but it's reasonably easy to identify and delete to make room for others.

Integrated streaming of a subscription service and your own music is great for piecing together a complete library, and the ability to host 50,000 tracks for free makes it painless to dip in and out of the subscription service as needs and finances allow. The only notable drawback is the lack of lossless audio.

OVERALL



# Tidal

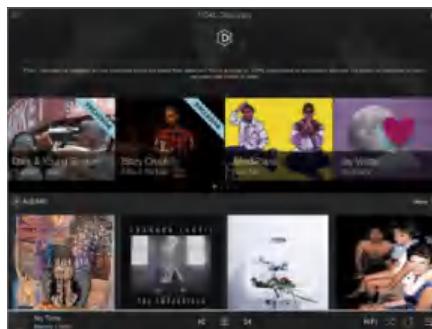
From the hype surrounding Tidal's March relaunch, you'd be forgiven for thinking that Jay Z and his celebrity mates had just invented CD-quality music. Then again, they seemed more excited about the increased profit margins offered by lossless streaming than the increased quality. The CD-quality service, Tidal HiFi, costs \$14.99 per month, or £17 if you pay for six months upfront. Tidal Premium, with 320Kbits/sec MP3 streaming, is \$23.99 a month.

Artists reportedly earn twice as much from the pricier tier, which possibly explains the enthusiasm of co-owners Jay Z, Beyoncé, Madonna and numerous other A-list pop stars. Whatever their motivations, the company's ownership has interesting ramifications. The launch event included a pledge to "deliver exclusive experiences". In practice, this means video content and curated playlists, plus exclusive tracks from some lesser-known artists. Time will tell whether Jay Z and co are bullish enough to pull their back catalogues from rival services. For now, this seems unlikely.

Putting the hype to one side, Tidal is

a credible alternative to Spotify. It has a library of 30 million tracks and a strong selection of editorial content. The Rising and Discovery pages are particularly noteworthy, showcasing upcoming artists. Biographies, similar artists and Twitter feeds are offered for each artist, and the interface is stylish and functional. It's delightfully simple to add artists, albums or tracks to My Music folders and create playlists, and people migrating from Spotify can convert their playlists using

✓ Tidal offers a polished interface and a variety of quality settings



third-party service **soundiiz.com**. Albums and playlists can be downloaded to the iOS and Android apps for offline playback at a choice of quality

settings, and there's a handy option to delete all offline music to free up space.

Then there's the ability to stream at lossless CD quality. The difference will be irrelevant, perceptible or critical, depending on your expectations.

If you're in the latter group, you won't need to be convinced, but, for those who are on the fence, it's reassuring that Tidal gives a choice of quality settings as well as prices.

Prices are in line with similar services for lossless and lossy compression and Tidal offers discounts for paying upfront. It comes down to a choice between Tidal's more polished interface and superior streaming quality, and cheaper low-fi alternatives.

## OVERALL



# Xbox Music (Groove)

Microsoft isn't the hippest brand around, and just as we were putting this feature to bed the company decided to rebrand its Xbox Music service to Groove – which is a "dad" brand if we've ever heard one.

Its Music Pass subscription is the cheapest unlimited streaming service on test, at \$11.99 per month, or \$119.90 for an annual subscription. Streams are encoded in reasonable quality WMA format at 256Kbits/sec.

Groove boasts the largest music catalogue at present, which for many will surely be a major appeal. Others with more precise tastes may prefer

alternative streaming options for their music.

The streaming service integrates with OneDrive to provide cloud streaming of your existing collection. You get 15GB for free; this increases to 115GB for Xbox Music Pass subscribers, or for \$4 per month if you don't want the full subscription package.

The complimentary capacity equates to around 1,500 tracks at 320Kbits/sec – not bad, but nowhere near Google's 50,000 free track limit. We particularly like the ability to download the entire cloud music library as a single ZIP file for backup restoration. However, there doesn't appear to be any effort to match uploads with the existing library to reduce the time taken to upload music.

A bigger disappointment is that playback of this cloud-based library is limited to Windows PCs and Xbox consoles. There are Android and iOS apps, but they can only play from the paid subscription service, not the cloud.



Otherwise the web interface, the Android and iOS apps and the preinstalled Windows 8 app share a similar interface, and there's not much to it. A Radio tab asks for an artist's

name and puts together a playlist. This would be much better if it were integrated into artist pages, rather than as a free text search.

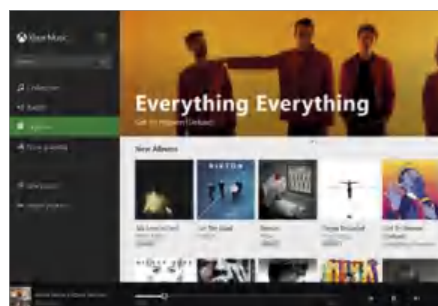
An Explore tab makes recommendations based on listening habits, but it's absent from the iOS and Android apps. Playlists include an Available Offline option that downloads them to local storage, but not being allowed to select individual albums is a pain. There's no support for Sonos devices, either.

It's tempting to save \$60 a year compared to Spotify, but Xbox Music's flaws mean it's a service that isn't much fun to use.

## OVERALL



< Xbox Music is cheaper than Spotify, but rather flawed







**Make It Yours.**

## The Cooler Master difference

■ It may surprise a lot of people, but back in 1999, Cooler Master was the first company to bring an all-aluminium PC case to the market – and it was a hit. It overturned the idea that computers had to be boring beige boxes, and over the next decade Cooler Master continued to innovate in the space. The company also helped bring side windows and other aesthetic flourishes into the mainstream, following the growing case-modding movement.

But it's not all about looks, as 2004 saw the release of the Centurion, with an all-metal mesh front designed to increase airflow in systems that were getting increasingly warmer as PCs got more and more powerful, and enthusiasts pushed their systems to the limit. That same year the CM Stacker series was introduced, which allowed dual power supply systems to be easily built.

2007 saw the mighty Cosmos line introduced, which sparked the dawn of a new age of PC case evolution, and the year after the High Air Flow range – or HAF – was introduced.

Now, we are at the dawn of another new era, with the MasterCase 5 series.



## Introducing the MasterCase 5

■ The MasterCase 5 is a whole new reimagining of PC case design. Many gamers and enthusiasts look upon their systems like a driver looks upon a performance sports car – it's an object of devotion, endlessly tweaked to perfection. The MasterCase 5 is designed so that enthusiasts can now not only tweak their components, but also their case.

Designed by a crack crew of modders, veterans, and gamers, the MasterCase 5 is designed from the ground up to be the most adaptable case ever made. Every panel can be replaced by alternative designs, with windows, mesh, or even carry handles. The interior can be customised for air or watercooling, for a lot or few hard drives, and for epic SLI or CrossFire setups.

The MasterCase 5 can be anything you want it to be.



***"It's the spirit that first inspired all of us to open our PC case."***

We see a future in which all of us work together and we're excited by the possibilities that might entail. So we're reaching out to people across our community and beyond to see how we can help them achieve their goals. Whether it's through sponsorship or promotion, components or know-how, Cooler Master is coming your way. And if you have an idea you think will work, using anything we have to offer or something we haven't thought of yet, just fire away.

Moving forward, the maker spirit is going to be apparent in all the things we do: cases, cooling and components. You'll be able to tell it was there during their design, lurking like a newbie fanboy, peering over shoulders. Just when our product designers sat back to rest, it would urge them to think again and try harder to provide more options, more hands-on flexibility; to improve the thermal elements, or scope for self-expression.



**Dilun Ho** VR DEVELOPER

## Meet the Makers

The door to Dilun's game development dreams opened when he discovered virtual reality (VR). "I was hooked and have devoured any news and talks online about it ever since. The countless possibilities with VR for creating and sharing immersive experiences excite and inspire me." Enough said.

That inquisitive drive has led Dilun to team up with designers and artists both in his hometown of Taipei, and remotely across the world. The 2015 Global Game Jam event in Taipei culminated in the creation of Maze Raider Co-op, a game that relies on teamwork to complete. One player in VR must verbally describe his environment to a map reader, who must rely on their information to navigate the player through a maze of deadly traps.

Curious to see where Dilun's creative potential could lead, Cooler Master recruited him to develop a VR experience for Computex 2015 in Taipei, providing him with a MasterCase and all the hardware he needed to put together something special...

**coolermaster.com/Dilun**



MasterCase Pro 5

### How does the design of the MasterCase 5 series inspire your creation of immersive VR spaces?

Having a clean and professional workspace is really important for me. The design of the new series is sleek, minimalistic and durable. It reinforces what I aspire my creations to be.  
- Dilun Ho

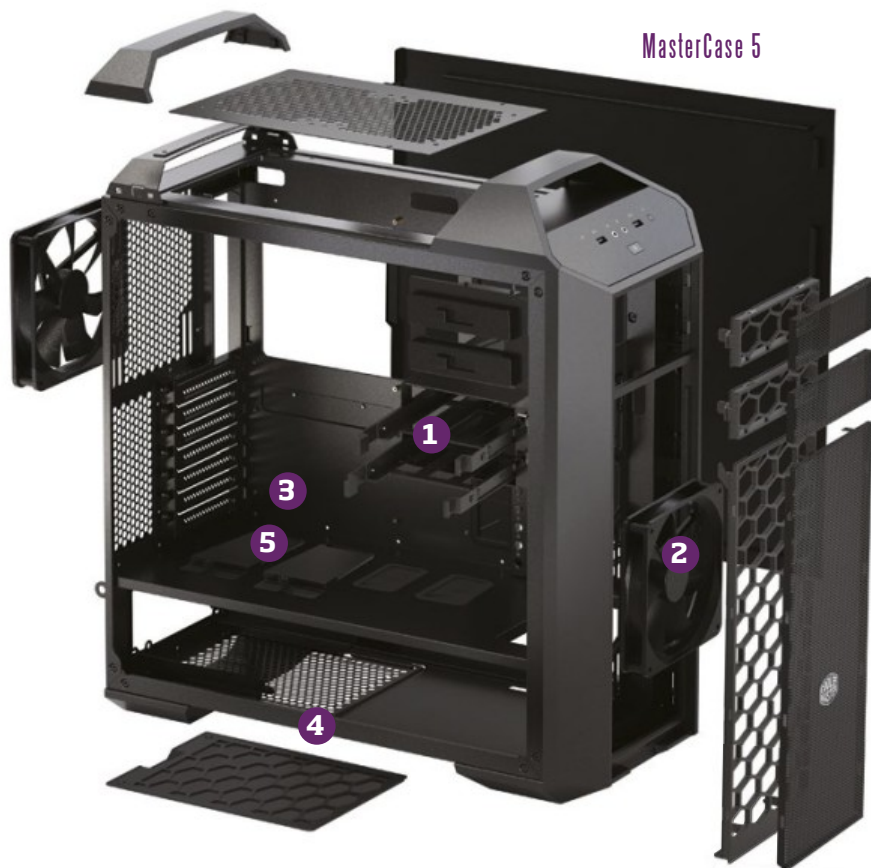
- ❶ Unique clip-and-click components panel
- ❷ Supports up to six 140mm fans
- ❸ Support for three dual-slot, extra long graphics cards
- ❹ Dual chamber design with partition panel
- ❺ Two slip-and-clip SSD drive pockets with four mounting positions
- ❻ Top panel with water cooling bracket for 240mm radiator support

### As a builder and maker, what are the features of the case that you appreciate most?

The flexibility. There is going to be new hardware dedicated to VR that will soon be on the horizon. I will also have the option to easily purchase add-ons and customize my case since it will save me time and effort from having to do it myself.

- Dilun Ho

- ❶ Unique clip-and-click components panel
- ❷ Supports up to six 140mm fans
- ❸ Support for three dual-slot, extra long graphics cards
- ❹ Dual chamber design with partition panel
- ❺ Two slip-and-clip SSD drive pockets with four mounting positions



MasterCase 5





# The Five programming languages to learn in 2015

**RUPERT GOODWINS** PROFILES FIVE CUTTING-EDGE LANGUAGES TO SUIT EVERY PURPOSE AND MOST SKILL LEVELS

Choosing a new programming language to learn is much like choosing a new human language: you have to know why you want to do it to have a good chance of success. In this feature, we've picked five of the most interesting new languages to wrap your brain around - ones that have a good chance of remaining significant in five years' time, and have features that promise intellectual stimulation and the best chance to explore new ideas.

If you're new to programming altogether, then it's best to start with a classic. C remains not only one of the most popular languages in actual use, but its spawn (C++, C#, Objective-C and so on) form a large part of the programming landscape in engineering, commerce and general applications. Getting acquainted with C is an excellent start: it is simple, fast and universal, and the concepts it teaches will serve you well in your programming career wherever you go next.

The major programming innovation since C was created in the 1970s is objects. C deals with code

and data in a rather unrestrained way; in general, any code can work on any data, so changes in one area can have unexpected effects elsewhere. Object orientation (OO) combines code and data into objects that are protected, safe components of the larger program. Java is a good contender for a first OO language, as well as being a valuable commodity on the market.

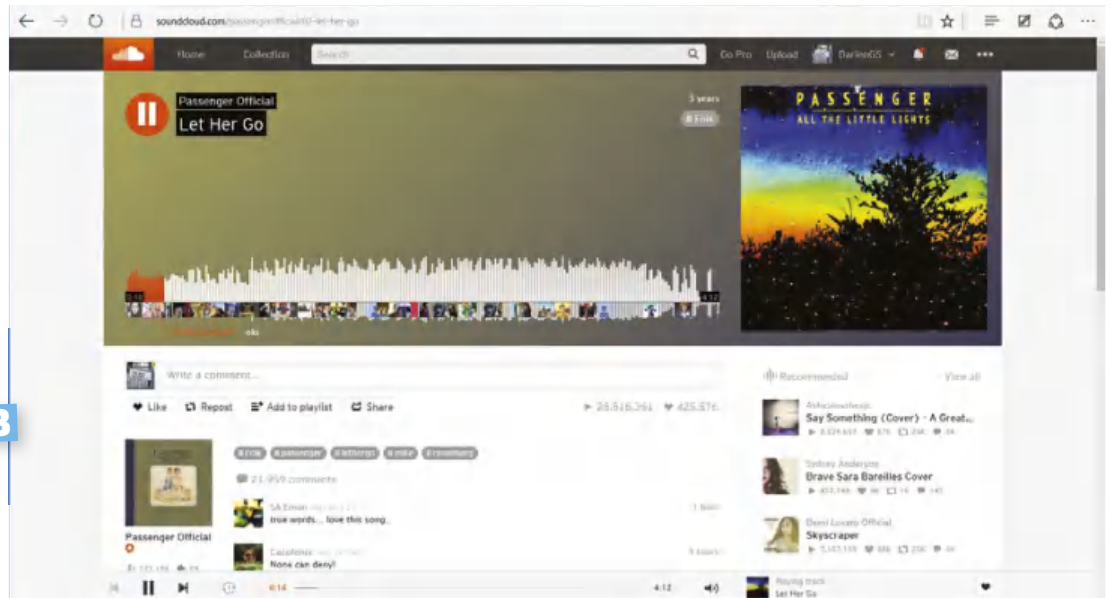
And if you're looking to learn a workhorse language for commercial use, JavaScript and Python are both excellent choices that use a mixture of techniques and philosophies from earlier languages. JavaScript is extremely fashionable and becoming more so; Python is quick to learn and can produce fast results due to huge, well-tested libraries of prewritten components. Both use lots of concepts from earlier languages, and both have an infinite number of good resources and expertise online to help you learn.

But enough of the sensible advice. Here are five of the up-and-coming contenders for the coolest, hottest new languages that are worth your consideration.



## BEST FOR BUILDING CLOUD/WEB SERVICES

# GO



Go is an open-source language from Google that's approaching its sixth birthday, and has quite some momentum behind it. You can find it under the bonnet of some painfully trendy products, such as the Docker containerisation system.

Famously, Go came about because a small group of Google programmers decided they hated the baroque topiary of C++. Aiming for a stripped-down focus on speed and simplicity, Go features built-in support for concurrency, so a single program can do multiple things simultaneously. It's devoutly multiplatform – you can develop on Windows, Mac, Linux and BSD – and it supports Intel, ARM and Power architectures, so yes, it's a good match for the Raspberry Pi. There's Android support, of course, and an iOS port.

Like Swift (see overleaf), Go combines ideas from scripting languages with a basic structure and syntax largely derived from C. It drops the requirement to specify the type of variables when initialising them, so `fred=10` is used instead of `int fred=10` and, like Swift, it isn't fussy about end-of-line semicolons. The Go team at Google has a stated aim that the entire language definition should be small enough to read in a couple of hours and “fit in a programmer's head”, although detractors say that too much has been lost regarding safety.

Concurrency supports multithreading and parallel processing, as well as asynchronous processes that are launched but have to hang around waiting for something to happen. The eponymous `go` statement launches a new process, while `chan` creates a new channel that processes can use to talk to each other through the `<-` operator. The `select` operator scans a set of channels, passing control on when one of them has data or a signal. These are all particularly apt for writing pipelines that efficiently process incoming data, network functionality and general server services, and Go has – unsurprisingly – very good web-service functionality, such as built-in HTTP serving and consumption support. It also likes large arrays of data and map functions.

This, combined with a lot of Google and third-party support for web services and database interfacing, has made Go popular for online service coding. People report it to be as quick to develop for as Python, with much better speed and lower memory requirements. Debugging Go

code isn't highly developed, with little native support; some third-party tools such as Mailgun take the approach of adding debugging code to your source, but there's no fully interactive debugger. Go does have native support for integrating and automating tests, versioning and repositories, app building and other features considered essential for production code and excellent discipline. You don't have to use these, of course, but this is the 21st century, after all.

With Go, you'll have to choose your own work environment; there are various integrated development environments (IDEs) and plenty of third-party support tools, and the usual, highly emotive factional debates around them. It's not as prepackaged as Swift, but it is more flexible: Apple versus Google in code form.

Go is still a divisive language with plenty of critics and, although it's been around for more than half a decade, the ecosystem around it is still evolving rapidly. On the other hand, its proponents can point to a great deal of running code out there and a very good match for the needs of distributed programming at scale.

It's probably not the ideal choice for your word-processing or mobile-gaming project, but if you want to do interesting things across networks... well, what else would you expect from a programming language that emerged from Google?

*With Go's parenthood, it's particularly good at web stuff. This code fragment is all you need for a simple server that listens on port 8888.*

```
package main

import (
    "net/http"
)

func main() {
    http.HandleFunc("/", http.FileServer(http.Dir("./")))
    http.ListenAndServe(":8888", nil)
}

};
```

^ The developers of audio app SoundCloud make heavy use of Go because it's a wysiwyg language – that is, the code does exactly what it says on the page

## BEST FOR IOS/MAC DEVELOPMENT

# Swift

There's plenty of buzz about Swift. Introduced last year by Apple as a proprietary language for iOS and OS X, the company has recently pledged to release version 2 as open source to encourage cross-platform development. Currently, though, you'll have to have OS X and run the Xcode development platform.

Intended as a replacement for Objective-C, Apple's previous "standard" language, Swift inherits its libraries of useful components, and much of the syntax and structure of the earlier language. Many of the changes make things less fussy - the terminating semicolon on each line is now optional - or more flexible, such as the way variable names can now use Unicode. Yes, you can stuff code with emojis, if you absolutely must.

Swift also sidesteps many of the standard traps that even experienced C-class programmers stumble over. Swift on Xcode has advanced, interactive debugging techniques, with "playgrounds" where you can inspect and modify code as it runs, instead of having to edit, compile, load and run. In general, the process of writing and debugging takes a lot from scripting languages such as PHP or Perl; it's less verbose than Objective-C, and does many things automatically that older languages required the programmer to attend to.

Swift has much to recommend it. Although large and complex, it is considerate of modern, web-based environments and the core business of writing actual code. It's backed by Apple but without Apple's "Sinatra Syndrome" ("You'll do it my way...") and, of course, it is highly focused on mobile platforms as well as the desktop. What's more, the development environment, although currently Mac-only, is highly capable. Against that, Swift is very new and will develop quickly in the next year or so, so you'll be chasing a moving target.

*Swift's switch construction simplifies selecting complex responses to a range of values - here, preventing painful mouth-burn during a fairytale food felony.*

```
var porridge = 50
switch porridge {
case 0:
    println("Frozen")
case 0...40:
    println("Too cold")
case 41...70:
    println("Just right")
case 71...101:
    println("Too hot")
default:
    println("That's no porridge")
}
// Help Goldilocks tell which bearish breakfast to pinch
```



▲ The attractive Yahoo Weather app for iPad is one of the many successful iOS apps that have been written in Swift over the past couple of years



## BEST FOR JAVA PROGRAMMERS AND FUNCTIONAL PROGRAMMING

# Scala

As with Go and C++, Scala is a language born partially of dissatisfaction, in this case with Java. Developed at a research university in Lausanne and part-funded by the European Research Council, it's just over a decade old.

Scala's Java heritage is considerable: it compiles to Java byte code, which runs on any standard Java virtual machine (JVM); its source code can be largely converted to Java source code; and it can use all Java classes. Its syntax and structure can look very similar to Java, but Scala code can be much more concise.

Unlike Java, everything is an object in Scala - including functions, numbers, operators... the works. So, functions can be used as arguments, stored in variables and returned as results to other functions.

Notably, Scala is multi-paradigm - it supports different styles of programming. This makes it possible for programmers to adopt Scala and carry on using their expertise from differing backgrounds. It does mean that it can be tempting to program in one way when another would be more efficient, however, which may have profound performance implications. But if you're learning a new language to improve your mental tools, Scala will reward your efforts.

And because it's designed to be scalable (hence the name) it's very good for creating what are, in effect, new languages within itself, particularly domain-specific languages (DSLs). These are very good at doing one specific task - say, running a financial model - so if your long-term interests lie in that direction and you want a high-level language with the potential for high reliability, performance and configurability, Scala has a case.

What Scala isn't is a language for beginners - even less so than Swift or Go. But Java knowledge will give you the basic framework to explore the rest of this language.

*Scala has a straightforward approach to adding methods, here creating a factorisation method that also illustrates recursion as an idiomatic alternative to looping.*

```
/* Adding ! as a method on ints */
object extendBuiltins extends Application {
    def fact(n: Int): BigInt =
        if (n == 0) 1 else fact(n-1) * n
    class Factorizer(n: Int) {
        def ! = fact(n)
    }
    implicit def int2fact(n: Int) = new Factorizer(n)

    println("10! = " + (10!))
}
```

## BEST FOR BOLDLY GOING INTO NEW REALMS OF PROGRAMMING

# Haskell

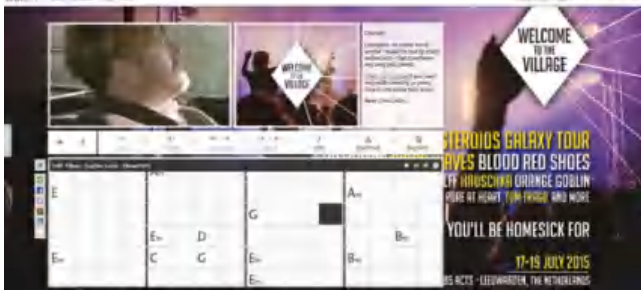
If Rust and Scala combine functional programming with other ideas, Haskell is having none of that nonsense: it's full-fat, cask-strength, uncut functional programming. You can't change variables. Everything is a function that will always return the same output for the same input. Go's logo is a cartoon gopher seemingly drawn by a five-year-old; Haskell's is the Greek letter lambda - for lambda calculus, the underlying mathematical basis of functional programming - overlaying the greater-than-or-equal operator ( $\geq$ ), because Haskell is not mucking about.

Forget about syntactical differences or which brackets are used where: Haskell forces you to think differently. It does so as gently as it can - Haskell programs don't look as arcane as Lisp, and it knows how to interface to other languages - but you must be prepared to work at rebuilding your ideas about what programming actually is.

If that excites you, then Haskell will be an adventure. If it scares or bores you, Haskell will be a pointless exercise in frustration.

Why bother? Haskell proponents say that while you probably won't use it to write a video game or a web server ("although you could" they invariably add), you will acquire a whole new set of mental tools to program better. Haskell is fast and can produce remarkably compact yet powerful programs for data analysis, hardware modelling and so on. It has a presence in engineering, finance, design and aerospace. Once you get good at it, you tend to get very good, and people appreciate its productivity.

And it has a firm mathematical basis: you can write bad software in Haskell, but if you take the time to understand the concepts and apply the philosophies behind it with care, you can produce results that are exceptionally reliable. It's not for everyone, but if you still have a love of computing as an intellectual amplifier, it can be enormously satisfying.

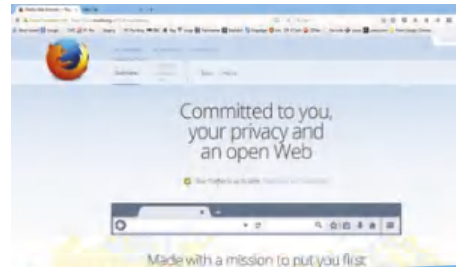


▲ Haskell is used for all manner of purposes, including Chordify - a service that identifies the chords used in songs

How do you write a loop when you can't decrement the loop count variable? Haskell won't let you, so our code sample uses recursion to say "Hello, Tim!" ten times.

```
printStringNTimes 0 = return ()
printStringNTimes n =
  do
    putStrLn "Hello, Tim!"
    printStringNTimes (n-1)
```

```
main = printStringNTimes 10
```



◀ Rust is being used to write Firefox's forthcoming browser engine, Servo

## BEST FOR CONCURRENCY AND WRITING SAFER CODE

# Rust

Rust is the newest language on the block, with version 1 appearing from Mozilla Research in May 2015. Like Scala, it's multi-paradigm and designed to support functional and object-oriented, as well as older, models, and to be safe, fast and concurrent.

Rust spends a lot of time keeping memory safe from incorrect reading or writing, eliminating a vast range of cases where serious or even critical bugs have snuck into C and C++ code. In particular, Rust has a strong concept of ownership and lifetime, where variables and things that depend on them are only valid while the code that owns them is active.

Rust can launch threads that execute independently of the main code, and these can communicate through shared variables. But independent things with the right to change each other's variables can be unsafe; Rust enforces strong rules here and won't compile code that may be unsafe.

Such safeguards mean people new to Rust consider it overly restrictive and fussy. However, experienced users report that it encourages a greater understanding of safe coding, which carries across when writing in other languages.

*Rust, like Go, is designed for a multithreaded environment. Here it creates five independent threads, which will be mopped up by the OS when they terminate.*

```
#![feature(scoped)]
```

```
use std::thread;
```

```
static NUMTHREADS: i32 = 5;
```

```
// This is the 'main' thread that spawns the rest
```

```
fn main() {
  for i in 0..NUMTHREADS {
    // Spin up another thread
    let _ = thread::scoped(move || {
      println!("this is new thread number {}", i)
    })
  }
}
```

## ONLINE RESOURCES FOR LEARNING PROGRAMMING

All programming languages have a vast range of online resources, but no matter what language you're looking at, the same tactics will quickly get you to places suited to your level of expertise and expectations. All languages have a homepage, but they also have online communities spread across sites such as Stack Overflow and Reddit (which belies its reputation for anarchism here - language subreddits are very well run) as well as various online forums. Most languages also have an IRC channel where experts, enthusiasts and users congregate for live chat - new learners are welcome, and these are ideal clearinghouses from which to find the best online tutorials, video demonstrations, tools and so on.



# SAMSUNG PORTABLE SSD T1

*Fast and reliable data access  
in the palm of your hand.*

**P**ortable data storage very much has a place in the modern tech world, yet typical flash drives lack the speed and storage capacity that we have been enjoying with internal Solid State Drives (SSDs). Samsung has an external drive solution that combines zippy performance, generous capacity and sleek design.

## FAST READ/WRITE PERFORMANCE

The Samsung Portable SSD T1 external drive is a speedy storage solution out of the box. Its USB 3.0 compatibility means sequential read/write speeds of up to 450MB/s\*, care of TurboWrite Technology and enhanced data transfer speeds with UASP.

The T1 external drive is designed specifically for Windows and Mac operating systems (Windows 7 or higher and Mac 10.7 or higher recommended), with a default exFAT file system for read/write functionality across platforms.

In lay terms it means superbly fast

access to files and an external-storage solution that responds like an internal SSD.

## SAFE AND SECURE DATA

There's no point worrying about the safety of your data when using an external drive. The user-friendly software wizard on the Samsung Portable SSD T1 offers the option to enable password-protected access. With password protection disabled, the T1 can be seamlessly used with compatible non-PC devices that support USB. With password protection enabled, AES 256-bit hardware encryption kicks in to block unauthorised access.

Designed also to physically protect your files, the T1's lack of moving parts makes it extremely durable as it exhibits significant resistance to impact shock. This means the T1 is safe to use in a range of different environments, with a limited three-year warranty for additional peace of mind.

## PORTABLE AND STYLISH

The T1 is lightweight and portable which means that it can be practically stored in a bag, slotted into a wallet, or quite literally slipped into a pocket, offering the portability of a flash drive with the capacity and speed usually reserved for internal SSD.

The slim, compact design is just part of the appeal. With laser patterning and a black chrome finish, the T1 is as much a chic accessory as it is a piece of portable hardware. It's fashionable enough to be trendy on the outside and fast enough to deliver the goods where it matters. All

you need to do is connect the matching jet-black USB cable to a compatible device, and you're able to instantly read, write and transfer your files.

## USER-FRIENDLY OPTIONS

There's no such thing as a one-size-fits-all solution when it comes to external storage. Some are looking for a medium storage option for files and pictures, others for storing raw images, and others still working with large video files. The T1 comes in 250GB, 500GB and 1TB models to suit external-storage requirements across a range of capacities.

You may not be able to depend on the consistency of an internet connection when you're out and about to access gigabytes of cloud-stored data, but you can rely on the Samsung Portable SSD T1. It has the speed and storage capacity of an SSD drive, the dependability and durability of enterprise-grade hardware, as well as the design and visual appeal that positively encourages you to take it everywhere!

## LATEST TECHNOLOGY

The T1 external drive takes advantage of some pretty clever tech to deliver its portable performance and reliability. Thanks to V-NAND technology, the T1 is able to achieve higher speeds, greater endurance and boosted power efficiency, while simultaneously offering a larger storage capacity. This is achieved by evolving the traditional 2D NAND storage principles and embracing a 3D vertically stacked internal structure.

*\*Performance benchmark products : T1(500GB)*





**SAMSUNG**



# PORTABLE STORAGE HAS EVOLVED

FAST. SAFE. STYLISH.

Samsung  
Portable SSD **T1**

Your world in your pocket

**JB**  
HI-FI

**Harvey**  
**Norman**

Available at selected stores

# IN THE LABS

You won't find better reviews anywhere in Australia!

## Skylake rising

**BEN MANSILL** WONDERS IF IT'S TIME TO DITCH Z97?

There's a lot to take in, consider, and hopefully conclude with the new Skylake platform. This is the new mainstream computing platform, should you choose the Intel CPU path, and will remain so for the next tick and tock, probably longer, as we're not expecting another socket change any time soon (although Intel has surprised us before).

X99 will remain as the highest performance chipset, along with the hex-core CPUs that go with it. But for normal people, and gamers, it's time to look at Intel's 6th gen CPUs, aka Skylake.

On face value, the two initial CPUs don't offer a huge leap over recent Intel CPUs. The math is fairly straightforward for that: if your current CPU is a year old, expect a 10% gain, two years = 20%, three years = 30%. As we all know, any Intel quad core from the last few years (since Sandy Bridge in 2011, really), is enough to last most of us two or three years, certainly for every day non-professional use. So, many of you will be edging into the

performance gap, and Skylake will warrant strong consideration.

I wish we could tell you more about the CPU micro-architecture, but in a big first Intel were keeping Mum about the details. This was a pretty radical departure from the usual info-dump we get with each new CPU, whether she be a ticking or a tocking. Word on the street is that Skylake actually has some extremely exciting secret capabilities and it will all come out after the annual Intel Developer's Forum. If that's the case, we'll have it all for you in the next issue.

For now, know that the two K-SKUs initially released won't disappoint.

### CHIPSETS AHOY!

The bigger news for now is the Z170 chipset, from Intel, powering the first new motherboards. With Z170 we have the full suite of next-gen SSD standards supported - including SATA Express, which is a dead duck standard and is wasting valuable motherboard resources, as well as adding

to the cost of these new boards. That said, I'm totally prepared to eat my words on that one if this sudden mass support for SATA Express somehow kickstarts it into life. But it won't.

Mark Williams has a few thoughts on Skylake back in Chip News (page 12), and Bennett's guide to the Z170 motherboards starts on page 50, and it's an epic explainer covering everything that's critical to understand about your (likely) next PC upgrade.

And we're just at the tip of the Z170 iceberg. We got hold of the first batch of boards from the majors for this round up, but these are but a tiny slice of what will be available in the months ahead. Not only will there be many more performance-oriented Z170 boards (some companies will have over two dozen in their range for this chipset alone), and through to Christmas and beyond we will see the mainstream H170 and H110 chipset-fuelled motherboards. Interesting times, and tricky yet enjoyable decisions lay ahead.



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**EDITORIAL & PRODUCT SUBMISSION:** PC & Tech Authority welcomes all information on new and upgraded products and services for possible coverage within the news or reviews pages. However, we respectfully point out that the magazine is not obliged to either review or return unsolicited products. Products not picked up within six months of submission will be used or donated to charity. The Editor is always pleased to receive ideas for articles, preferably sent in outline form, with details of author's background, and - where available - samples of previously published work. We cannot, however, accept responsibility for unsolicited copy and would like to stress that it may take time for a reply to be sent out.

### WHAT OUR A-LIST MEANS

Our A-List award is reserved for the best products in each category we review. With a winner and an alternative pick in each, that's 92 products you know are first class.

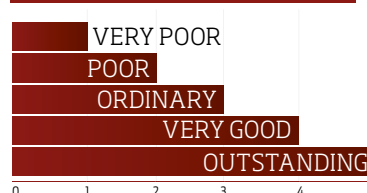


### WHAT OUR AWARDS MEAN

PC & Tech Authority's comprehensive Real World testing sorts out the best products from the pack. Any product recommended by PC & Tech Authority is well above average for features, value for money and performance.



### WHAT OUR RATINGS MEAN





# HOW WE TEST

Our benchmarking tests are the best in the business. Read on to find how they work...

## 2D TESTS

Desktop PCs and laptops are tested using our own custom bench testing suite, which has been carefully designed to test all aspects of a system and rate them in a way that's useful to you.

Our benchmarking cover three main tests: a typical video editing test, a demanding 4K video editing test and a multitasking test that stresses all aspects of the system.

We look at the time it takes for each test to run, which is then compared to our reference PC to produce a normalised result. This score is shown on a graph, and to help you understand just where the PC we're reviewing sits in the grand scheme of things, we will often include other system's scores.

The median score of 100 is based on our reference system:

## PC & TA REFERENCE PC. SCORE: 100

Intel Core i5-4670K CPU; 8GB of DDR3 RAM;  
AMD Radeon R7 260X graphics card

On occasion we will run publically available bench testing software, predominantly PCMark 8 from Futuremark. This is run in the Home setting, in Accelerated mode. You can get PCMark 8 as well as 3DMark (below) from [www.futuremark.com](http://www.futuremark.com)

## 3D TESTS

For video cards, as well as Integrated Graphics Processing Units, we use:

- 3DMark Firestrike
- Shadow of Mordor
- GRID Autosport

3DMark is designed specifically to test video cards, and you can download and run the same tool as us to help you gauge where your own GPU ranks compared to what we are reviewing.

The two games were selected because they are relatively well balanced in performance between AMD and Nvidia, favouring neither. Both feature a wide range of DirectX 11 shaders. GRID Autosport is fairly easy on GPUs, while Shadow of Mordor is quite demanding, so each provides a helpful gauge for you showing what to expect from a GPU in your favourite games. We will update these to cover DX12 once that API gains traction.

Tests are run using three resolution ranges, depending on where the GPU sits in the market:

Entry level: 1920 x 1080

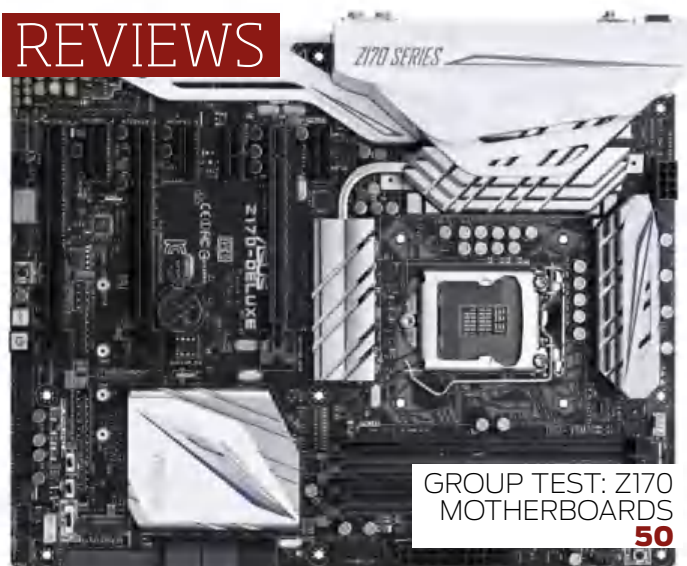
Mid-range: 1920 x 1080 – 2560 x 1440

High-end: 2560 x 4K

## BATTERY TESTS

Screen brightness is set to 120cd/m2, playing a 720p video on loop until the device runs out of power.

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# HP EliteBook Folio 1020

ASTONISHINGLY EXPENSIVE, BUT WITH THE QUALITY TO MATCH; HP HAS BUILT ONE OF THE FINEST BUSINESS ULTRABOOKS YET



Close your eyes and imagine a world where business laptops are beautiful. Gleaming ingots of metal pared to perfection, all precise curves and metallic sheen; silent and lightweight, secure and well connected. The envy of any boardroom. Now open those peepers, and behold: the EliteBook Folio 1020 makes those reveries a reality. At a price.

My colleague caught his first glimpse of HP's EliteBook Folio 1020 back in January. It left its mark, his eyes lighting up each time HP teased his inbox with the prospect of an impending review unit. And I can see why he was smitten. It's not the most individual-looking laptop out there – you'd quickly recognise it as an Ultrabook, sporting the familiar uniform of matte black and grey metal – but the Folio 1020 treads just the right line between understated and handsome. By business laptop standards, though, it's gorgeous.

## DESIGN

The workmanship that's gone into crafting the Folio 1020 is outstanding. At 1.26kg, it's nowhere near as feathery-light as Apple's MacBook, but HP's Folio 1020 feels exactly as a flagship laptop should. The combination of granite-tough build, smooth metals and a grippy, rubberised base are a delight.

Why mention the MacBook? For good reason. Despite one being focused on business, the other on pared-back simplicity, the Apple MacBook and the Folio 1020 have plenty of similarities. First, HP has followed Apple's lead by opting for the Core M family of

processors, surprisingly foregoing the Core i5 or i7 CPUs more commonly found in other high-end Ultrabooks.

Less controversial, however, is the decision to equip the Folio 1020 with an optional high-DPI touchscreen, one that promises to be every bit as captivating as the MacBook's Retina display.

That, admittedly, is where the similarities end. For one thing, the HP is made of much harder, more versatile stuff than its Apple cousin. How so? The Folio 1020 has survived the MIL-STD 810G tests for high and low temperature, altitude, humidity, dust vibration, shock and accidental falls. The two drain ports on the underside of this laptop allow liquid spillages to seep through the keyboard tray without doing irreparable damage. An occasional, ill-advised meeting with a glass of water or cup of tea won't turn the Folio 1020 into a paperweight.

And where Apple has shorn the MacBook of all connectors bar a USB Type-C port and a headphone socket, HP has made no such compromise. A brief scout around the HP EliteBook Folio 1020's predominantly metal shell reveals a pair of USB 3 ports, a full-sized HDMI port, microSD slot, headset jack and a proprietary docking connector. It's thicker and heavier than the

> The HP Folio 1020's super-sleek design will attract envious looks

^ Great build quality; accurate high-DPI display; connectivity and security are beyond reproach but it is very expensive, performance is modest and the touchpad is quirky

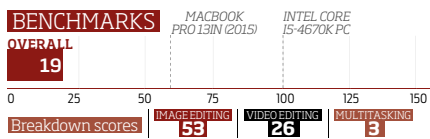
MacBook, but far more practical.

Wondering where the all-important Gigabit Ethernet and VGA connections have got to? Look in the box. You'll find an adapter that hooks up to the 1020's docking connector, providing both. Other all-important business essentials such as TPM 2 and a fingerprint reader have also made the cut. This is an ultraportable with few compromises.

## HARDWARE

Those who crave power, even in tiny packages, may rue HP's decision to employ a Core M rather than a low-voltage Core i7, but it's a sensible choice. You could argue that efficiency, rather than power, should take priority in a 12.5in chassis.





Few will even notice. Task a Core i7 and a Core M processor with brief, fleeting workloads, and you'll be hard-pressed to tell the two machines apart. The Core M architecture is designed specifically to open the throttle just long enough to meet brief spikes in demand, time enough to fire applications into life, or speed compute-heavy operations along, before easing back to its nominal clock speed to keep heat under control.

The combination of 8GB of RAM and speedy flash storage do a good job of masking the 1.1GHz Core M-5Y51's limitations: it's rare that the HP feels out of its depth. Not until you push the EliteBook with sustained workloads such as video editing or transcoding does it show signs of struggle – but these are jobs you're unlikely to perform on a business laptop with any regularity.

## BENCHMARKS

The Folio 1020's benchmark results eloquently prove the point. In our image-editing tests, which involve multiple short bursts of image processing, the HP is only 25% slower than a Core i5-powered 13in MacBook Air. In other words, it's certainly no slouch.

In tests presenting a more sustained load – such as video transcoding – however, the HP is 39% slower. Understandably, though, it's the sustained, multithreaded loads that really floor the Core M hardware. Here, the low-voltage design quickly reaches the limits of its capabilities: it was a whopping 85% slower than the Core i5-powered 13in MacBook Air in the multitasking tests.

If performance is a priority, then you can spend extra on a model with the faster Core M-5Y71 CPU, but don't expect miracles. With a nominal clock speed that's only 100MHz faster than the Core M-5Y51, and a Turbo Boost speed that's only 300MHz faster, it won't make a night-and-day difference.

The Core M has its positive points, however. No matter how hard you push the HP, there isn't a whisper of noise: the Folio 1020 is completely fanless. Even then, the HP doesn't get particularly hot. After several hours of chewing through our brutal multitasking test, the Folio 1020 was no more than warm to the touch. HP's engineers have obviously

done their homework.

Battery life is another plus point. With the screen brightness calibrated to 120cd/m<sup>2</sup> and Wi-Fi switched off, the Folio 1020's 5,000mAh battery kept the laptop going for 6hrs 58mins. That's more than long enough to survive a working day.

## DISPLAY

HP knows a thing or two about making a great display, and the Folio 1020 is no exception. I'm pretty fussy when it comes to image quality – I've seen more than my fair share of high-end monitors – and the

*“An occasional, ill-advised meeting with a glass of water or cup of tea won't turn the Folio 1020 into a paperweight”*

HP's high-DPI, 2,560 x 1,440 touchscreen is extremely good. Colours are natural and believable, and the high pixel density delivers pin-sharp text and images.

Put to the test, the HP's display is on a par with the Apple MacBook's Retina screen. Brightness reaches a respectable 354cd/m<sup>2</sup>, contrast soars to 1,084:1, and the panel covers 93.6% of the sRGB colour gamut. Colour accuracy is on point too, with an average Delta E of 2.4 and a maximum deviation of 4.7. It's one of the best displays I've ever seen equipped on a business laptop.

You could save cash by dispensing with the touchscreen altogether and opting for a Full HD display instead, but would I recommend it? No. At the time of writing, the price difference is around \$340 – for that money, I'd take the Quad HD display every time.

## ERGONOMICS

There's little to criticise about the Folio 1020's keyboard: it's superb. HP has combined a sensible, spacious layout with backlit keys that deliver a responsive feel and oodles of feedback. This might not be a big laptop, but the keyboard doesn't feel cramped in the slightest. It really is as good as it gets; and it feels noticeably better than the 13in MacBook



▲ In terms of connectivity, the Folio 1020 makes no compromises

Pro I have in front of me.

The touchpad may divide opinion, however. Built on Synaptics' ForcePad technology, the Folio 1020's glass touchpad doesn't actually move at all when you press it. Hear that click? It's actually coming through the HP's speakers; if you mute the audio, the touchpad is silenced. Unlike Apple's Force Touch system, it provides no haptic feedback whatsoever.

It takes some getting used to, but in practice it works well; it feels smooth and highly responsive. If you want to click and drag an onscreen item, tap it to select, then simply maintain pressure on the pad, and drag it as normal. You can adjust the pressure required in the Synaptics control panel.

Would I prefer a traditional touchpad and separate buttons, though? Yes. Like me, you may miss the reassuring presence of a physical click, or even the haptic sensation of one. Make sure you try before you buy.

## VERDICT

So that touchpad may end up costing the Folio 1020 some customers, which is a shame because this is a fantastic all-rounder. For me, there's not one area where it falls short: it's light, compact and capable, and it feels built to last. It's a business laptop that's as refined and desirable as a MacBook, yet there's no compromise on connectivity or security.

If you need more power than the capable Core M can muster, that's reason enough to look elsewhere, but otherwise there's very little reason to criticise the HP EliteBook Folio 1020. The only problem is that you may not be able to afford it. I know I can't.

**Sasha Muller**

## KEY SPECS

\$2740 • [www.hp.com.au](http://www.hp.com.au)  
1.1GHz Intel Core M-5Y51 • 8GB RAM • 180GB SSD • 12.5in 2,560 x 1,440 touchscreen • Bluetooth 4 • 802.11ac Wi-Fi • 2 x USB 3 • HDMI • Windows 8.1 Pro 64-bit • 310 x 210 x 16mm (WDH) • 3yr RTB warranty

## OVERALL





# Microsoft Office 2016 for Mac

OFFICE ON OS X FINALLY NEARS PARITY WITH THE WINDOWS EDITION - BUT IS THE VENERABLE SUITE STILL RELEVANT?

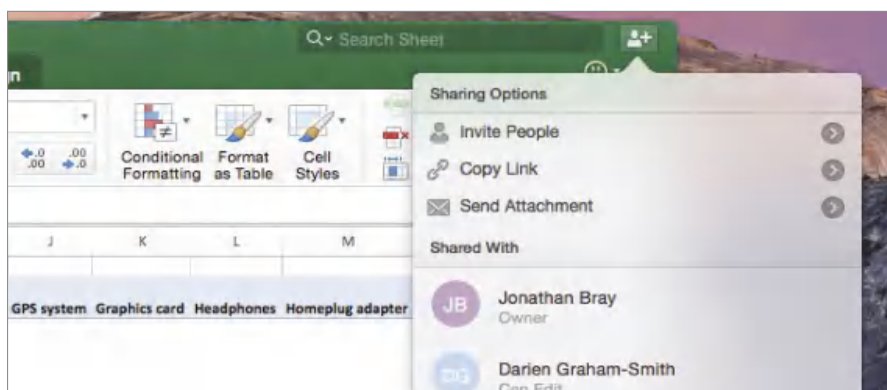
It's been a long five years since the previous release of Office for the Mac. Now, at last, a major upgrade brings the OS X suite up to date – for Office 365 subscribers, at least. If you want to buy the software outright you'll have to wait until September. Microsoft hasn't revealed how much this will cost, but it may be a tough sell now that iWork is free, and Google Docs is so much more powerful than it used to be. The onus is on Office for the Mac to prove it's still relevant.

## WHAT'S NEW?

The first thing you'll notice about Office 2016 is that it finally gains a proper ribbon interface. It looks a little out of place on the Mac, but it's a big improvement on the clunky tabbed toolbar of old. It's more compact, yet less cluttered than before. There's full support for Retina displays too, and if you choose the "colorful" option during setup, each application window is edged with its signature colour: green for Excel, dark blue for Word and so on.

Interestingly, Office 2016 also brings certain keyboard shortcuts across from

✓ The ribbon interface brings consistency across Mac and Windows

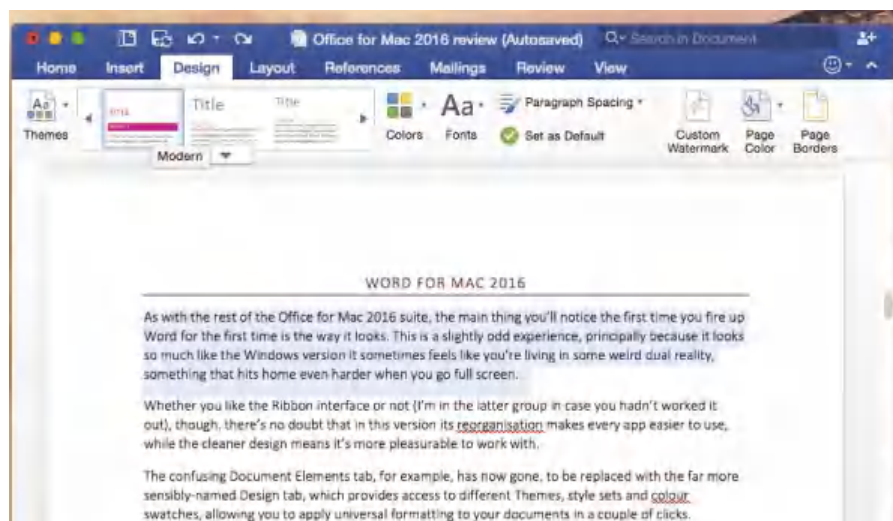


Windows, allowing you to use the Ctrl key instead of Command when copying and pasting. At first, this might seem helpful for people who hop between platforms, but it's confusing when you switch to a non-Microsoft app that doesn't recognise Windows-style shortcuts. Even within Office, it's inconsistent: for example, in Excel, Ctrl+Home and Ctrl+End take you to the top and bottom of your sheet, but the same combinations don't work in Word.

In some ways Office 2016 is superior to its Windows counterpart. Multitouch touchpad gestures work seamlessly, with smooth scrolling and pinch-to-zoom controls, something Windows has never really got right. And the confusing "Backstage" File menu is replaced by a regular dialog box, with easy OneDrive integration. It could do with a search box, though, and there's no third-party cloud integration yet, so you don't get easy access to Dropbox or Google Drive.

## WORD 2016

Word is arguably the centrepiece of Office, and its interface gets a welcome update. The old Document Elements tab is replaced with the more sensibly named Design tab, giving access to different Themes, style sets and colour swatches.



▲ Spreadsheets can be shared with a single click

The Inspector panel has disappeared too: some of its features move to the ribbon, while the style selector becomes a dockable panel.

Word 2016 also lets multiple users collaborate on a document – even if they're on Windows or iOS. This isn't live collaboration as with Google Drive, where you can see others typing in real-time, but it works well: as you edit, dotted lines indicate the paragraphs that have been updated, and each time you save you're notified if others have changed anything.

Not everything from Word 2013 for Windows is here. Real-time style previews don't make it, and the Office app framework seems to have been quietly dropped. The touchscreen features of Office 2013 for Windows are also missing, although that makes sense, since Macs don't have touchscreens. One feature I miss is the Reading view: although intended for touch operation, the distraction-free view was welcome.

In all, Word 2016 is a huge improvement on the old version. It's cleaner, easier to use and boasts useful new features. Once you start using it, you certainly won't want to go back.

## EXCEL 2016

The latest version of Excel brings welcome look-and-feel updates, with the ribbon joined by new cell and highlight-selection animations: these don't add anything meaningful to the toolkit, but they make the application feel much more modern.

Full support for Retina displays helps too, making even the smallest text on the fiddliest spreadsheets readable. And multitouch support really proves its worth, allowing you to pan around large spreadsheets with a simple two-fingered swipe. If only it worked this well in the Windows version!

The more substantial new features are largely transplanted from Excel 2013. The Recommended Charts tool takes

*“Much nicer to use than Office 2011, thanks to a host of usability improvements but the feature set still doesn't fully match the Windows edition”*

the guesswork out of generating graphs from vast sprawls of data – although the Mac version lacks the pop-up selector of the Windows edition. Pivot tables also gain a “Recommended” tool that lets you generate a table with a single click.

There are some features still missing. There's no Power View, for instance, nor PivotCharts or Power Query. The Quick Analysis tool introduced in Excel 2013 doesn't make the cut, either. And while it's easy to set up a shared spreadsheet (just click the sharing icon to generate a link), only one person can work on a spreadsheet at a time. Believe it or not, you have to close your file if you want someone else to edit it directly. Still, overall, this upgrade is undeniably more capable and easier to use than the old 2011 edition.

## POWERPOINT 2016

PowerPoint for the Mac has historically looked rather inelegant next to Apple's smooth and intuitive Keynote – but for this release, Microsoft has rationalised and reorganised the interface. Users of the previous version will find that some of their favourite features have been shuffled around, but the new arrangement makes it much easier to come in fresh and get results.

The big new feature is an options pane that appears when you apply an animation to an element on a slide. Although there are no new features available for animation, having them all at your disposal in one place makes it much easier to tweak and fiddle, which should help you produce slick presentations.

There's also a handful of new themes and transitions to help novices spice things up a bit. My favourite change concerns the cleaned-up Presenter view, for use when presenting from a laptop to a second screen or projector, which gains a small feature that alone makes the update worthwhile: a button for switching displays. No more frustration trying to manually switch displays after connecting my MacBook Pro to a projector.

In all, PowerPoint is now a much more credible competitor to Keynote. It has all the same features and more, and the improved interface puts the important stuff at your fingertips. If you're on Office 365, this might be the best reason to update today.

## ONENOTE 2016

OneNote wasn't in Office 2011, coming later as a free download from the Mac App Store. This new version is still free: all you need is a Microsoft account. Notes and files go into your 15GB of OneDrive storage.

OneNote 2016 isn't much different from the original version, aside from the new look and the ability to OCR notes uploaded to OneDrive. The note-taking process remains very easy: click anywhere in the editing area and start typing, and your words appear in place. Each note can contain any number of textboxes, images and audio recordings, which is handy for meetings. Better still, OneNote syncs your typing to your recordings as you take notes in meetings: click on the audio icon next to a paragraph in your note, and you're taken straight to that part of the recording.

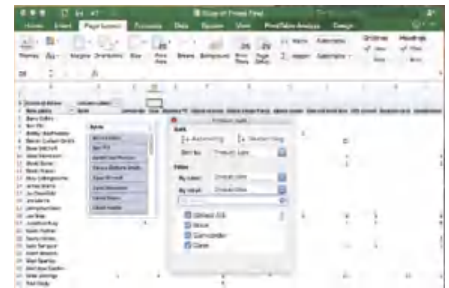
OneNote's weak area is integration with Outlook. You can't copy a message directly into OneNote, nor create tasks directly from your notes as you can in Office for Windows. But you can share a notebook with a group of people, and changes made by others appear in (more or less) real-time. It's cross-platform too: you can share a notebook between Mac, Windows, iOS and Android users, and have all edit notes simultaneously.

This makes it a very powerful collaborative tool, and the audio features are a definite plus – but the lack of Outlook integration is a disappointment.

## OUTLOOK 2016

Outlook for the Mac has never enjoyed the same range of capabilities as the

✓ PowerPoint's new interface brings the most important features to the fore



△ Excel for Mac 2016's pivot-table toolset gains a boost with the addition of Slicers, which add quick button-based data filters

Windows edition. Alas, that doesn't change in this new release.

First, the good stuff: the three-pane interface works well, with a useful set of toolbars that's consistent with the rest of the Office family. And it's fast: you don't find yourself waiting around for anything.

Start using it, though and you'll realise that many power-user features are simply not there. There's no scheduling of emails, for example, and no integration with either OneDrive or OneNote. Nor does Outlook make use of Mac-native features: there's no integration with the system-wide address book, no gestures and no full-screen mode, even though every other Office application supports it.

Not for the first time, I'm left wondering why anyone would choose Outlook on the Mac, given that Apple Mail, Calendar and Contacts all support Exchange natively. A fully featured version of Outlook for Mac could be a great addition to Office, but this isn't it.

## VERDICT

If you have an Office 365 subscription, you've nothing to lose by upgrading. Office 2016 for Mac is more attractive, easier to use and more powerful than ever before. Multitouch support makes for a smoother working experience, and the improvements to PowerPoint in particular can actually make you more productive.

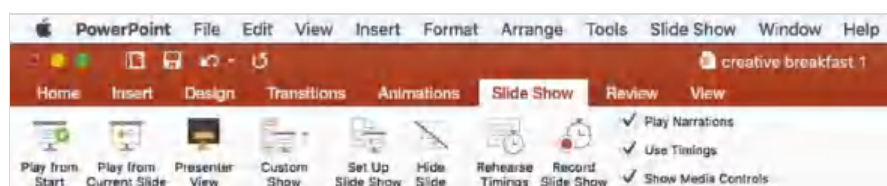
Since the last release of Office for Mac back in 2011, however, a lot of people have discovered that they can get along quite happily with iWork or Google Drive. If you're in that camp, and aren't already paying for Office on a monthly basis, you probably won't find much in this 2016 release to tempt you back.

**Jonathan Bray**

## KEY SPECS

\$9.99/month (Home, 5 users); \$6.99/month (Personal, 1 user) · [www.microsoft.com](http://www.microsoft.com)

## OVERALL



# Aorus X5

AS NOISY AS IT IS IMPRESSIVE

What price are you willing to pay for the convenience of a portable gaming machine that doesn't weigh several kilos? Aorus figures there are gamers out there who are willing to pay a pretty penny for such a machine, evidenced by the premium price tag on the X5. For a tad over three grand you get a gaming laptop that weighs just 2.5kg, yet packs in some seriously hefty hardware.

The overall dimensions are dictated by the 15.6 inch display, and it's a beauty. The native resolution of 2880 x 1620 is rather odd to say the least, but it's crystal clear thanks to the high pixel count and the use of an IPS panel. The fact that it's also G-Sync compatible means that the twin GeForce GTX 965M GPUs should be able to power most games at a framerate that will still look smooth – anything over 35 or 40fps looks great on G-Sync.

## 3DMARK FIRESTRIKE

Aorus X5 - Gaming Fan Mode: **7807 59dB**

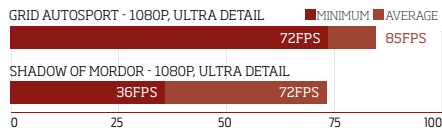
Aorus X5 - Quiet Speed Fan Mode: **2228 42dB**

Aorus X5 - Normal Speed Fan Mode: **3445 51dB**

Gigabyte (the comp behind Aorus) has stu two of these into the X easy feat considering the slim dimensions. It's no surprise then that fan noise is a bit of an issue; when set to gaming mode, the X5 churned out a rather raucous 59dB of fan noise.

The rest of the hardware matches the impressive graphics subsystem; an Intel Core i7-5700HQ CPU, 16GB of DDR3-1866MHz memory and twin M.2 256GB SSDs in RAID 0 mode. A 1TB HDD provides ample back up space for your larger files.

Given the specs, the excellent benchmark results were no surprise. It blitzed through all three tests, though our Shadow of Mordor result isn't really indicative of real world performance, as SLI doesn't work in this test. Combine this



blazing performance with the G-Sync panel and this laptop should be able to deliver silky smooth gameplay in anything you can throw at it. The Aorus X5 proves it's possible to have top-tier mobile gaming performance in a very small package, but buyers should be aware that it howls like a banshee under load as a result of cramming such powerful hardware into such a small space.

**Bennett Ring**

## KEY SPECS

\$3299 · [www.aorus.com.au](http://www.aorus.com.au)

15.6" 2880 x 1620 IPS display · twin GeForce GTX 965M GPUs · Intel Core i7-5700HQ CPU (quad core, HyperThreaded, 3.5GHz Turbo).

## OVERALL



# Asus Zenwatch

A VERY COMPETENT ENTRY INTO THE SMARTWATCH RACE.

From deep involvement with the PC componentry space, to industry-changing products like the EeePC, Asus has always been willing to chance its arm at everything in the tech-space. Sure, it's often with mixed results, like the Transformer Book V, but you have to love the company's moxie. Now, it's looking at the buzz around smartphones, and so has produced its own, the charmingly luxurious ZenWatch.

We say luxurious because of the lovely leather watchband, and charming because this makes the ZenWatch look like an actual watch, rather than some kind of outsized rubber tech fetish. It sits very comfortably on the wrist, and the watchband itself can be easily swapped out for other bands, and you don't even need specialist tools, thanks to a simple catch on the band. The watch also features an oddly placed on switch, which sits on the underside of the case – this seems a touch superfluous on a touch and motion-activated device.

The ZenWatch uses Google Wear, which works well on the timepieces'

Qualcomm Snapdragon 400 processor. Swiping screens is smooth and responsive, and voice recognition is particularly good. There's also Asus' own ZenWatch Manager App, which adds a few more bells and whistles, like unlocking your smartphone when your watch is nearby – that one's actually really handy.

Battery life is more or less what you'd expect. On average, we got a solid day or so out of the ZenWatch, but really you'll be charging it every evening, or while you're sitting at your desk at work. It's also let down by a rather small, albeit elegantly curved, screen, which is dwarfed by a rather large bezel. Asus has also chosen to place the watch's heartbeat sensor around the watch frame, so that you have to actively touch it get an on-the-spot reading, so, if you were looking for a good watch to track fitness, the ZenWatch is not ideal. It's also not all that accurate at step-tracking, delivering some widely inaccurate results over multiple days.



However, it's also pretty well-priced for such a good looking watch. You can find the ZenWatch for as little as \$179, which makes it a great smartwatch to try if you're just not sure. It's attractive and comfortable to wear, and Google Wear itself is getting better with each update. If you don't need fitness tracking, it's a solid alternative.

**David Hollingworth**

## KEY SPECS

\$199 · [www.asus.com.au](http://www.asus.com.au)

Qualcomm Snapdragon 400 1.2GHz · 512MB RAM · 320 x 320 AMOLED screen · 4GB eMMC Flash storage · requires Android 4.3 or later.

## OVERALL





# Lenovo Yoga 3 14in

THE YOGA 3 IS A LIMBER 14IN HYBRID WITH A POTENT SPECIFICATION - BUT IT'S FOUND LACKING WHERE IT COUNTS

Lenovo's Yoga hybrid design is elegant in its simplicity. Take a standard laptop, add a touchscreen and throw in a hinge that allows the display to fold back through 360 degrees. The device can thus transform into a giant tablet, prop up in a "tent" mode for video or presentations, or contort into "stand" mode with the keyboard positioned face down.

With its 14in screen, the Yoga 3 is the largest Yoga yet: at 1.65kg and 18.5mm thick, it's not a device you'll want to use in tablet mode regularly. It's not much of a looker, either: it lacks the fancy watch-strap hinge of the recent Yoga 3 Pro, and the matte-silver plastics covering the base and lid (retail models will also be available in white) fall short of delivering a premium feel.

Thankfully, the same isn't true of the internals. The \$1199 model comes with a 2.2GHz Core i5 Broadwell CPU, 4GB of RAM and a standard HDD paired with 8GB of solid-state cache. The \$1749 model on review here bumps up the specification to a 2.4GHz Core i7-5500U CPU, 8GB of RAM and a 256GB SSD.

Yet despite those powerful components, the Yoga 3 fared quite poorly in our benchmarks, with an overall score of 33 – 26% behind the similarly equipped Asus Zenbook UX303LA. While right on target in the image-processing section of our benchmarks, the Yoga 3 dropped 16% behind the Asus in the video-encoding test, and was 61% off the pace in the multitasking tests. The CPU doesn't run hot and there's no obvious throttling; nor are there any rogue processes languishing in the background – it's thoroughly odd.

Battery life was pretty good, however. With a 720p video looping constantly,

✓ The Yoga design enables the screen to be rotated into stand mode



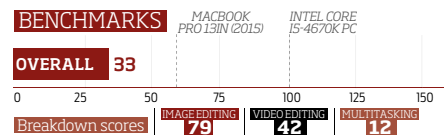
Wi-Fi switched off and the screen brightness set to 120cd/m<sup>2</sup>, the Yoga 3 lasted a credible 8hrs 22mins.

The Full HD touchscreen looks good too, at least on first glance. The IPS panel is crisp and consistent from every angle – an essential trait for a display designed to be used in multiple modes. The gloss finish also helps images pop.

Look more closely, however, and it's clear Lenovo has cut a few corners. Contrast hits an impressive ratio of 1,193:1, but brightness tops out at 240cd/m<sup>2</sup> – not much better than we'd expect from a budget laptop. Colours lack punch too: our tests revealed that the IPS display can reproduce only 60% of the sRGB colour gamut. Dark shades in particular get crushed, so watch a moodily lit movie and you'll be left wondering what's happening in the shadows.

Despite the Yoga 3's size, connectivity is limited, with only two USB 3 ports available for connecting peripherals. However, since the power supply connects via a modified USB connector, you can use the socket as a supplementary USB 2 port when you're not charging the device. The micro-HDMI connection is maddening: there's plenty of space for a full-sized port. The SD slot leaves the card jutting out by a centimetre or so, as well. Still, 802.11ac and Bluetooth 4 are welcome, and the 0.9-megapixel webcam is fine for video chats – even if images do fizz with noise and edge-enhancement artefacts.

The Yoga 3's keyboard feels good thanks to the snappy feedback from the rubberised, backlit keys, but the layout takes some getting used to, primarily due to the row of buttons to the right of the

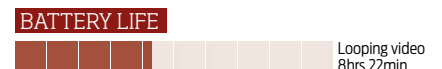


Enter key. I often found myself hitting the End or PageUp keys by mistake.

The touchpad is mediocre, with too much friction to deliver smooth control, and a buttonless design that's plain aggravating. Thankfully, the touchscreen is sensitive, responsive and accurate.

I'm a fan of Lenovo's Yoga range, but for \$1749 I expect a great display and ergonomic design as standard. The Yoga 3 doesn't deliver on either count. In fact, it doesn't really deliver on the Yoga concept at all: it's too bulky to use effectively as a tablet, while limited connectivity and a middling screen make it a poor laptop. I suggest you check out the Asus Zenbook UX303LA instead: it's faster, better-looking and far more refined.

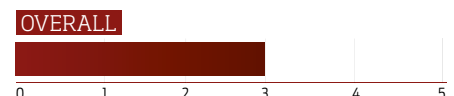
**Sasha Muller**



**KEY SPECS**

\$1749 • [www.lenovo.com.au](http://www.lenovo.com.au)

2.4GHz Intel Core i7-5500U • 8GB DDR3 RAM • 256GB SSD • 14in 1,920 x 1,080 touchscreen • Intel HD Graphics 5500 • 802.11ac • Bluetooth 4 • 1yr RTB warranty • 335 x 230 x 18.5mm (WDH) • 1.65kg (1.85kg with charger)



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# HP Pavilion All-In-One

AN ATTRACTIVE AIO DESKTOP PC FROM A REPUTABLE MANUFACTURER THAT SKIMPS ON SPECS, BUT NOT PRICE

**H**P has Apple squarely in its sights with the Pavilion All-In-One PC. With its edge-to-edge glass display, metal base, and clean aesthetic, it certainly looks the part.

It has a dimpled plastic back, and at the rear are four USB 2.0 ports, the power plug for the external power pack, an HDMI port, and a Gigabit Ethernet port. There is also a Blu-Ray drive built in, and cooling is helped by vents on the top of the unit.

On the underside of the PC are a 3-in-1 media card reader, a 3.5mm headphone jack, and two USB 3.0 ports. I found it difficult to insert a USB stick into a USB 3.0 port without tilting the whole display. Height adjustment would have helped, but the PC only has tilt adjustment, which is unfortunate.

The gloss black LED touchscreen is a looker, but reflects ambient light quite badly, and fingerprints show up too easily. The thick bezel detracts from its premium aspirations, as does its 1920x1080 resolution. WQHD (2560x1440) resolution

would have been nice, especially given the multitasking requirements of its student and home user target market.

Its multimedia capabilities are commendable, with full HD videos looking crystal clear, and the sound is surprisingly good, assisted by Bang & Olufsen's Play Media software, which provides equalizer presets optimised for particular media. There's also a webcam built into the bezel, which is handy.

Internally, the HP has an Intel Core i7-4785T CPU running at 2.20GHz, 16GB DDR3 RAM, a 2TB 7200rpm SATA HDD, an AMD Radeon R7 M360 with 4GB dedicated DDR3 memory, and a wireless-N/Bluetooth 4.0 NIC. An SSD would have been a welcome addition, but I suspect capacity over outright speed is HP's objective here.

Windows 8.1 64-bit is installed, and the HP comes plenty of free software pre-installed, such as a 30-day trial of McAfee Central, CyberLink Media Suite, 7-Zip, Evernote, and Skype, among others.



The HP Pavilion AIO is a valiant attempt at an iMac competitor in the PC space, but too many hardware and software compromises prevent it from being a viable alternative, especially since you can spec up a superior Retina iMac for a similar price.

**Peter Gutierrez**

## KEY SPECS

\$2699 – [www8.hp.com](http://www8.hp.com)

27in Full HD touch screen • Intel Core i7-4785T CPU @ 2.20GHz, 16GB DDR3 RAM, 2TB SATA HDD • AMD Radeon R7 M360 dedicated graphics card

## OVERALL



# HP Pavilion 11-K014TU x360 Convertible Laptop

A TOUGH AND CAPABLE DEVICE WITH EYE-CATCHING LOOKS

**H**P's latest iteration of the Pavilion x360 line of convertible laptops has features that are usually reserved for more premium devices, while also being reasonably priced.

The model I tested came in Sunset Red, which together with its brushed metal-like finish is certainly eye-catching, compared with the flood of black, white, and silver laptops out there.

On left of the chassis are the power and volume rocker buttons, along with a USB 2.0 port and a 3-in-1 media card reader. On the right are two USB 3.0 ports, a 10/100 Ethernet port, HDMI, dedicated Windows button and a 3.5mm headphone jack. Gigabit Ethernet isn't really missed, as its 802.11ac Wi-Fi capabilities provide high-speed network connectivity.

Its Core M CPU won't set any speed records, but its 128GB M.2 SSD makes up for this shortfall, and the included 4GB of RAM is sufficient for most student and

home user tasks.

Bang & Olufsen have been called upon to manage sound duties, and it does so with aplomb. B&O's Play Media software brings out the best in the stereo speakers, with equalizer presets for particular media.

The multi-touch trackpad works well enough, as does the chiclet-style keyboard, but sadly it isn't backlit.

This laptop's party trick is centred around its WLED touchscreen. Although its native resolution is only 1366x768, the screen is able to swivel all the way back against the base, allowing the laptop to be used in tablet mode. Having Windows 8.1 installed also encourages users to get hands-on.

It does feel a bit bizarre at first, having your fingers press against the keyboard when it's folded back, but the keyboard deactivates as soon as the screen is turned past the horizontal axis. You can also use the touchscreen in 'tent mode'



and 'stand mode', adding to its versatility.

It's just a shame the screen's vertical viewing angle in landscape mode is somewhat poor, which makes using it as a tablet in portrait mode almost impossible. Its hefty weight also prevents extended tablet mode use, something a detachable screen could have prevented. But not a bad little device at all, given its price point and the myriad ways you can use it.

**Peter Gutierrez**

## KEY SPECS

\$999 – [www.hp.com](http://www.hp.com)

11.6in WLED touchscreen • Intel Core M 5Y10C CPU @ 2GHz, 4GB DDR3 RAM, 128GB M.2 SSD • 802.11ac Wi-Fi, 10/100 LAN

## OVERALL





# Amazon Kindle Paperwhite

A TOP-NOTCH EBOOK READER THAT'S A STEP UP FROM THE PREVIOUS MODEL; IT RUNS THE KINDLE VOYAGE VERY CLOSE

The original Kindle Paperwhite, launched in 2013, impressed us with its clean appearance and integrated lamp. By now, however, most people who want a Kindle will already have one. Is there any reason to upgrade to this year's Paperwhite? Or, if you're shopping for your first ebook reader, is the flagship Kindle Voyage a better bet?

There's little outward difference between the new Paperwhite and the previous generation. It's still plain, dull and black all-round, and it still feels exceedingly well made – bend it and it barely emits a creak. The soft rubberised back sits comfortably in either hand, and there are no sharp corners that dig in. It's understated, so you're not distracted from what you're reading.

The screen, however, has had a big upgrade: although it's the same size as its predecessor's, measuring 6in across the diagonal, the new Paperwhite uses the same 1,072 x 1,448 E Ink Carta screen as the \$299 Kindle Voyage. It's the best E Ink display on any device, with a 300ppi pixel density for beautifully crisp text, particularly at smaller sizes.

There's also a new default font, Bookerly, which takes over from the venerable Caecilia – although you can switch back if you prefer. An updated typesetting engine brings enhanced support for hyphenation, justification, kerning and ligatures, as well as drop caps. In books that support the new features, text should appear more like the real thing, with characters appearing less gappy than before.

Amazon hasn't added to the font size options, however, nor the line spacing or margins – and there's still no option to turn off justification. If you like your text just so, the Kobo Glo HD offers far more flexibility for a similar price.

Elsewhere, as with other Kindle readers, there's a light for reading in dark or dim environments, but no storage expansion. The pricing is familiar, too. The basic Wi-Fi-only model is \$199, while the 3G version costs \$269.

It's not only the screen that the 2015 Paperwhite has in common with the Voyage. Both devices offer 512MB of

RAM, a 1GHz processor and 4GB of storage, which will store thousands of books and is more than enough for most keen readers. However, where the Voyage's touchscreen sits flush with its borders, the Paperwhite's is inset slightly (because it uses infrared optical technology, rather than capacitive sensing).

Personally, I prefer the raised lip: it means I can feel the edge of the screen, and so avoid highlighting text or turning the page by accident. It works better when you're wearing gloves, too.

Another difference is that the Voyage's light is noticeably brighter than the Paperwhite's – and also slightly more yellow, while the Voyage's looks a touch pink in comparison. Contrast is lower, though, resulting in text that looks slightly greyer.

None of this will make a huge difference to the reading experience. What might swing your opinion, however, is the fact that the Paperwhite has no light sensor – you have to fiddle with the backlight manually. There are also no physical buttons for turning the page, which will irritate some folk.

When it comes to reading material, the selection of ebooks on the Kindle ebook store is second to none, but there are also a host of features on Amazon's platform that others can't match. These include the excellent look-up facility, which is enhanced in the new Paperwhite. Now, when you select a word onscreen, the reader displays Highlight, Note, Share and Search shortcuts, as well as boxes for the dictionary definition, Wikipedia entry and translation, which you can flip between by swiping left and right.

Amazon has also recently added the excellent Family Library feature, which allows two adults to share content with each other and up to four children. Couple that with Kindle for Kids, which



allows parents to set and “celebrate” goals by awarding achievement stickers, plus a range of top-quality (if slightly pricey) covers and cases, and you have an all-round offering that no rival can top.

The big limitation of the Kindle platform is the fact you can't read titles purchased from other ebook stores on Amazon ebook readers (it's possible, but not legal). The Kobo readers are a better bet if this is important to you.

For most people, however, a Kindle is the ebook reader to own. And when it comes to choosing a model, it's between the new Kindle Paperwhite and the Kindle Voyage.

The former offers a similar reading experience at a lower price; but the latter goes the extra mile, with a more attractive design, lower weight, swanky page-turn buttons and better contrast. The bottom line: both are brilliant reading devices. Just buy the one that best suits your budget.

**Jonathan Bray**

## KEY SPECS

**\$199** · [www.amazon.com](http://www.amazon.com)

6in 1,072 x 1,448 E Ink Carta display · 2GB storage · single-band 802.11n Wi-Fi · optional 3G · 1yr RTB warranty · 117 x 9.1 x 169mm (WDH) · Wi-Fi only, 205g; 3G, 217g

## OVERALL





# Antec S10

THE VETERAN CASE-MAKER MAKES A MIGHTY STATEMENT THAT IT'S STILL IN THE GAME.



Antec was once one of the major powers in PC case design, with lines catered to gamers, silent-computing enthusiasts, and system-builders. However, the last few years has seen the company's impact on the segment wane. Corsair has made a name for itself in the premium space, while hungry aspirant BitFenix has taken the budget crown. Much of Antec's products were looking either very samey, or entirely out-of-date, by comparison.

Antec has come out swinging, however, with a case that impressed at this year's Computex trade show; now, in the flesh and in our labs, it's very much a whole new mission statement. The S10 looks like no other case the company has released before, with a range of best-of-breed features and design elements that make it one of the most versatile and downright impressive cases we've seen in years.

The S10 is a mighty E-ATX form factor tower, tall and seemingly narrow, but packed with room. It looks narrower than it is due to the tapering forward quarter of the case, and it's a neat effect for such a monolith-like design. It's almost completely covered in lush black-anodised aluminium, though sadly the upper exhaust grill is cheaper plastic. That disappointment aside, even at first glance the S10 has some extremely interesting features.

Unlike many case-makers' top of the line models, Antec's not ditched an external optical drive slot, but in the S10 it angles upwards, not forwards, allowing

the front fascia to be a plain, aluminium surface. But if you're not wedded to optical drives, it is the perfect position for fan controller, water-cooling monitor, or other add-on. Antec has, however, done away completely with USB2; instead. The S10 sports four USB3 ports along the leading edge.

Normally, plain front fascia would be some kind of air-intake, but this case tackles air intake with what Antec calls a Central Air Intake – this hints at the case's interior thermal modelling.

Antec has done away completely with USB2, however, and the S10 sports four USB3 ports along the leading edge.

But before we leave the outside, we've got to give full marks for the side-panels, which hinge open along an off-center split, and are made of heavy, 4mm aluminium, sitting on handy slot-in-hinges, with lots of rubber reinforcing for quiet operation. Even their impressive weight will help dampen noise. It does make the case very heavy though, but you're rarely going to want to move around a case of this size anyway.

The Central Air Intake runs through the case from side to side, and the interior is in turn split into three distinct thermal zones. The chamber in front of the air-intake is for storage, while the upper back zone is for components, with the PSU getting a zone all to itself (and, again, featuring some of the heaviest rubber padding we've ever seen in a case).

This 'three chamber design' keeps hardware with different thermal loads separated, making heat management

that much easier. Only Silverstone's Raven case – and the altogether over the top Thermaltake Level 10 – have managed to make such a design work. In this instance, it's also backed up by a whopping seven fans at stock, with room for more, or any number of water-cooling loops and radiators. In fact, there's space for a either 240 or 180mm radiator in the top panel, either of 240, 280, or 360mm radiators in the center of the case, and a 120mm radiator in the rear panel. There's room for all kinds of fancy builds, from huge SLI gaming monsters, to heavily storage-optimised builds for video editors, and the like.

All of this is backed by very impressive build quality, and some elegant design touches – like the removable panels. Each in-take slot has a removable dust-filter, there's ample room for the most complex of cable management, and the entire chassis simply smacks of quality. Of course, this does come at cost – the S10 is retailing for \$699, which represents a lot of actual PC hardware you could buy instead if you're on a budget. And the oversight of the plastic upper grill does seem odd with that pricepoint.

But if you absolutely must have what is very nearly the best case we've seen in a while, well – money's hardly likely to be a concern.

**David Hollingworth**

## KEY SPECS

**\$699 • [www.antec.com](http://www.antec.com)**

6x Quick Release tool-less 3.5in drive bays • 8x Quick Release tool-less 2.5in drive bays • 2x 140 mm top exhaust fans (Motherboard Chamber), 3x 120 mm intake fans (Motherboard Chamber), 1x 120 mm rear exhaust fan (Motherboard Chamber), 1x 120 mm exhaust fan (HDD Chamber) • 10x PCI expansion slots • 4x USB 3, HD audio in/out • Mini ITX / Micro ATX / Standard ATX / XL-ATX/E-ATX

## OVERALL



# Vigor2860ac

## Perfect NBN Solution for Small-to-Medium Businesses

**DrayTek**  
Aust & NZ  
[www.draytek.com.au](http://www.draytek.com.au)

VDSL2 /ADSL2+ Multi-WAN Gigabit router with dual USB ports for 3G/4G connectivity and IEEE 802.11ac Wi-Fi achieving speeds up to 1300Mbps



new



## Features:

- ✓ Multi-WAN with VDSL2/ADSL2+, Gigabit Ethernet WAN (NBN), USB ports for 3G/4G dongles
- ✓ Flexible Failover and Load-Balancing among Multi-WANs.
- ✓ Two USB ports for connection to two 3G/4G LTE USB modems, FTP server and network printer
- ✓ Supports VigorACS SI (Central Management system) for multi-site deployment
- ✓ Object-based SPI Firewall and CSM (Content Security Management) for network security
- ✓ Multiple VLANs provide secure and efficient workgroup management
- ✓ Six Gigabit LAN ports with multiple subnets
- ✓ Thirty-two VPN tunnels with comprehensive secure protocols
- ✓ Advanced VPN load-balancing and site-to-site backup functions
- ✓ Integrated IEEE 802.11ac wireless Access Point; dual band; up to 1300Mbps throughput
- ✓ Embedded Central VPN Management for 8 remote Vigor routers
- ✓ Embedded Central AP Management for Vigor wireless Access Points
- ✓ Free Smart Monitor Network Traffic Analyzer for 30 nodes



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# Asus MG279Q

NOT YOUR AVERAGE GAMING DISPLAY

Until now, if you wanted a gaming display with a super-speedy refresh rate, your only option was a TN panel. This display tech is fantastic at switching photons on and off at light-speed, which is why it's the weapon of choice in 144Hz monitors, but it's not so great when it comes to viewing angles or colour accuracy. If you're after the latter qualities, the competing IPS technology delivered a better viewing experience, at the cost of motion blur.

But what if there was an IPS-powered display that had all the benefits of this type of screen, but was also fantastic at gaming? Enter the MG279Q from Asus, an IPS display that has been specifically bred for serious gamers.

At a grand, this is one expensive 27 inch display, especially considering the native resolution of 2560 x 1440. It's possible to pick up a larger 30 inch 4K panel for the same price these days, but as with all monitors at the moment it is possible to be very specific about your needs, and

have them met.

The MG279Q brings a blazing fast refresh rate of 144Hz to the table, as well as being fully FreeSync compatible. AMD's Variable Refresh Rate technology works between the ranges of 35Hz and 90Hz, one of the better ranges available for FreeSync displays. Outside of that and the monitor kicks back into standard V-Sync on or off mode. Unlike earlier FreeSync displays, this monitor can handle running FreeSync simultaneously with the display's Trace Free mode, which helps reduce pixel response time to just 4ms.

Speaking of which, we barely noticed a hint of blur on this display, which is quite remarkable for an IPS panel. Whether it was blasting through Battlefield or tearing up the streets in Grid, the onscreen motion was smooth and blur-free. Yet it also has all the benefits of IPS, with a lovely wide 178 degree viewing



angle and beautifully accurate colours. There's no denying how exorbitantly expensive this display is, yet its clever use of IPS technology with low pixel response times delivers one of the best 27 inch gaming displays we've seen.

**Bennett Ring**

## KEY SPECS

\$999 • [www.asus.com.au](http://www.asus.com.au)

27 inch • 2560 x 1440 • AMD FreeSync compatible • 144Hz Refresh Rate • 4ms grey to grey response time

## OVERALL

0 1 2 3 4 5

# Viewsonic VP2780-4K

PROFESSIONAL QUALITY AT A CONSUMER COST

There are high quality monitors, and then there are professional monitors. While most prosumers are happy with the former, the latter are aimed squarely at professional users who demand the utmost in colour accuracy. They're the kind of users where a single, slightly misrepresented colour could cost thousands in reprinting costs, simply because a brochure didn't come out the way it looked on-screen. This new 27 inch

4K display from Viewsonic is targeted at these users, yet its price is surprisingly affordable. Does it cut the mustard compared to the likes of Dell?

Given its preferred habitat of an office, the fully adjustable stand is a welcome inclusion, making it easy to set up in the perfect position. The thick black bezel and chunky stand aren't exactly sexy, but this thing is designed for productivity, not prettiness. Four touch-buttons on the front open up the OSD, but we were very surprised to see a lack of advanced colour tuning options. While it's possible to tune these settings from your graphics card when calibrating, professional displays usually have these options as well.

Out of the box, the screen's brightness is cranked up extremely high, measuring 416 cd/m2 with our lightmeter – 120 is average for desktop use. Lowering the brightness brought this back within specs, and we let our i1 Display Pro colorimeter do

an automatic colour calibration, before measuring colour accuracy. The average result of just 0.4 is excellent, as anything less than one is basically seen as perfect. Thanks to the use of an IPS panel, viewing angle performance was exceptional.

This display isn't designed for gaming, but we thought we'd put the 5ms Grey to Grey response time claim to the test. As expected, ghosting and blurring was relatively easy to spot when compared to dedicated gaming displays, but it's fine for a spot of movie viewing.

With colour accuracy, as well as the fact that it's a full 4K panel, Viewsonic has delivered an extremely competitively priced display for the serious user.

**Bennett Ring**

## KEY SPECS

\$1200 • [www.viewsonic.com.au](http://www.viewsonic.com.au)

27" 3840 x 2160 IPS panel • 10-bit colour • 1 x HDMI 2.0, 2 x HDMI/MHL, 2 x DisplayPort 1.2a

## OVERALL

0 1 2 3 4 5



# Labs Briefs

## Sony Xperia E4

[www.sony.com.au](http://www.sony.com.au) • \$129

Sony's latest smartphone line-up includes this \$129 budget number. We trialled one for a month and while there are no performance surprises (good or bad), for the price it's a real deal. A MediaTek 1.3GHz processor is sufficient for smooth Android operation, and all but the most demanding apps. It's paired with 1GB of RAM and a scant 8GB of storage to keep the cost down. Included, too, is a microSD slot, something some premium phones are foregoing. The 5in 960 x 540 screen isn't too bad, and again, for the price it's very reasonable.

The 5MP rear facing camera is its best feature. At this price it really is quite good, with social snaps turning out well. Sony's been making decent phone cameras for a long time, and this one benefits from a host of included photo apps as well as HDR support for a bit of extra pizzazz in your shots.

It doesn't look too cheap either, with a solid plastic case that's appealing in its own way. Up against the \$239 Moto E, its closest competitor with very similar specs it's the budget champ for sure.

**Ben Mansill**

OVERALL



## Apotop Wi-Copy

\$139 (RRP) • [www.atop.net](http://www.atop.net)

If there was a Swiss Army Knife for computing, the Apotop Wi-Copy would have a strong argument to claim that title. This diminutive black box is a powerbank charger, wireless storage provider and Wi-Fi router/repeater rolled into one. Oh, and this is all accessible from your iOS or Android device, via a free downloadable app.

Simply plug a USB drive or SD/SDHC/SDXC card in and switch it to Wi-Fi mode, then connect to its own wireless-N network. You can then access the contents of the storage through the app, but only certain file formats will work. You can also upload/download files, or transfer files between a USB drive and an SD card. It also supports SAMBA, FTP, HTTP, and DLNA protocols for non-mobile devices.

You can also plug a network cable into it to create a Wi-Fi router, or connect to an existing wireless network and turn it into a repeater. Not a bad little device at all.

**Peter Gutierrez**

OVERALL



## Crucial BX100 SSD

\$95 (120GB); \$135 (250GB);  
\$230 (500GB) • [www.crucial.com](http://www.crucial.com)

Crucial's MX100 SSD was a star performer in the budget SSD stakes last year, and it's now been superseded by the BX100. Now, the MX range denotes high performance (also superseding the M550 SSD), while the new BX moniker is for budget drives.

But you'd be hard pressed to find anything budget about the BX100, which we benched at a very premium 523MB/s read and 432MB/s write (the 500GB model, using AS SSD). That's properly high-end speed, and only premium drives like Corsair's Neutron XT range will do much better, and only by an impossible to notice 20MB/s, max, at nearly twice the price.

The 500GB model we tested yielded 465GB of formatted space, which is a little disappointing.

Online pricing for this SSD is as low as \$230, which at near enough to 50c per GB is the cheapest SSD we've tested, and also one of the fastest.

**Ben Mansill**

OVERALL



## Jabra Sport Coach

\$199 • [www.jabra.com.au](http://www.jabra.com.au)

I love the Jabra Pulse headphones and still use them everytime I go for a run, so when I heard that Jabra were bringing out some new headphones I was pumped.

The Sport Coach are Bluetooth wireless headphones aimed at the cross training/ CrossFit crowd that have done away with the Pulse's heart rate monitor and replaced it with a built-in motion sensor. The sensor is only used when running to provide distance, pace, step, cadence and calorie burn data, which was a bit disappointing as when cross training it doesn't count your reps which means you need to tell the app when you have finished each exercise.

The Jabra Sport Life app is brilliant though, with in-ear coaching helping you workout and letting you know what exercise to do next time (pre-made or designed by user).

Sound quality is the same as all Jabra products we've looked at, delightful! Dolby Audio with rich bass and crisp vocals make all genres of music enjoyable to listen to. To top it off the Sport Coach are extremely comfortable and have an IP55 rating making them sweat and weather-resistant, perfect for training.

**Tim Frawley**

OVERALL



## AEE ShotBox S71 Camera

\$439 • [www.shotbox.net.au](http://www.shotbox.net.au)

When this GoPro-esque camera arrived on my desk I thought here's another want-to-be action camera. My initial opinion changed quickly as I unboxed the tiny camera and its plethora of accessories such as a removable 2inch TFT touchscreen, waterproof case (100M), humonitor kit and pouch and several mounts and joints, it has all you need to get started.

When comparing the S71 to the GoPro Hero4 Silver (\$579) the differences are few; both have Wi-Fi and smartphone apps, both have touchscreen backs and both shoot video at 4K/15fps, 1080p/60FPS and 720p/120fps. The S71 shoots 16MP stills, has 10x digital zoom and a 1500mAh battery for up to 3 hours recording (compared to GoPros 12MP, no zoom and 1160mAh battery).

Using the S71 is easy, especially with the aid of the touchscreen (to change camera settings this needs to be attached). Although starting and stopping recording with different buttons is a bit odd.

Overall it's a brilliant little camera that does what a GoPro Silver can do at a cheaper price.

**Tim Frawley**

OVERALL



## Edifier Luna Eclipse Speakers

\$299 • [www.edifier.com.au](http://www.edifier.com.au)

The stylish, curved design of the Luna Eclipse speakers belies the power and solidity of the unit. Each of the speakers is deceptively heavy, thanks to the number of drivers they house. The front of the unit features a 3" (7.6cm) woofer and a 19mm tweeter. Housed in the back of the unit are two 3" passive bass radiators that deliver bass response far greater than you usually expect from stereo PC speakers.

The sound quality is excellent overall, with clear high, mid and low range tones, making them great for music, gaming and movies alike.

The speakers are Bluetooth compatible, but due to the fact that there is no kind of connection dongle included either third party dongle, built in Bluetooth or a wired connection is required. The speakers only include a capacitive power switch and volume controls as well as a small remote featuring the same controls, so don't expect any fine tuning unless you want to do it through your desktop.

**Daniel Wilks**

OVERALL



## Seagate Wireless

\$159 • [www.seagate.com.au](http://www.seagate.com.au)

Last year's Seagate Wireless Plus packed storage into a Wi-Fi hotspot, and while it was far from the only product of that type, being a Seagate it became quite popular when stacked up against the proliferation of budget brand models. The product we're looking at here is a less well-equipped version. It loses USB 3, and unlike the Plus, is only available in 500GB capacity.

But it's a (we think) reasonable \$160 or so, which is pretty decent for a mobile Wi-Fi hotspot with storage. The Wi-Fi operation is only 802.11b/g/n, but that's still plenty of bandwidth to stream movies or music. The battery is good for about six hours of media streaming, and of course much much longer acting purely as a data hotspot. This is also very handy for travellers, and road warrior business people. There's a range of funky colours, if you're a funky person.

**Ben Mansill**

OVERALL



## Asus ROG Whetstone

\$49 • [www.asus.com.au](http://www.asus.com.au)

There are some PC peripherals you upgrade more than others.

There are some that are sturdy, but that you always think about switching up. Then, there are mousepads, something which usually only gamers (and designers) get excited about. And the Whetstone, for what it is, is pretty exciting.

The Whetstone features an attractive and grippy 'Mayan-inspired' surface that feels very smooth to mouse over and offers highly accurate tracking of mouse movements. The surface has a subtle cloth texture, and is bonded to a silicon backing that absolutely does not budge on your desktop, no matter how frantic your gaming activity.

Previously, we had been enamoured of solid mouse mats, but the silence, feel, and flexibility of the Whetstone has won us. It's easily the best mouse mat we've seen in years, and has taken pride of place on our gaming test rig.

**David Hollingworth**

OVERALL





# SKYLAKE BOARDS

WHAT TO LOOK FOR IN A NEW Z170  
MOTHERBOARD, AND A TEST OF THE FIRST  
BOARDS OFF THE BLOCK BY **BENNETT RING**



According to Intel's Tick/Tock manufacturing cycle, PC builders can look forward to an improved CPU architecture roughly every two to three years. A Tick represents an existing CPU design being built on a smaller process, such as the shrink from the 22nm process used to build Intel's Haswell chips, down to the 14nm process used in Broadwell. Ticks usually represent lower energy usage and cooler operating temps while performance remains the same, so they're not really noteworthy from an upgrading perspective. A Tock is the more exciting part of the cycle, as it represents the introduction of architectural improvements, and these bring the performance increases that should make upgrading worthwhile.

Intel's Skylake, now known to the public as the 6th Generation Core processor, is an interesting product in regards to this cycle, as the extended delay of Broadwell meant that we only saw this 14nm Tick arrive a month ago. Yet Intel didn't delay the release of Skylake's Tock, releasing these new CPUs just a month later. As expected, the Tock part of the cycle is accompanied by a new range of motherboard chipsets, and at the upper end of the performance spectrum we have the Z170 chipset. With Skylake's performance improvements being rather minimal to say the least, it's fallen upon the Z170 chipset to drive upgrades, and for once the new

motherboard platform is actually more interesting than its supporting CPU.

## IT'S ALL ABOUT PCI EXPRESS

At the time of the Skylake launch, only one new Intel chipset was available in motherboards – the Z170. This is positioned as a successor to the Z97 chipset, and is aimed at the performance segment thanks to its premium features. X99 is still Intel's super-high end product, but Z170 boards at the upper end of the spectrum are fetching similarly high prices. In fact, we've never seen such a

*“Buyers of Skylake have no choice but to upgrade to a new Z170-based motherboard with socket 1151”*

huge range of prices based on a single chipset before, with prices starting as low as \$192 (the ASUS Z170-P-D3) and then soaring all the way up to \$849 (the Gigabyte GA-Z170X-Gaming G1). Overall we're rather surprised by the generally high prices of Z170 boards – while they're feature-rich, we also suspect a little bit of price gouging as the hardware market has been relatively flat of late.

Buyers of Skylake have no choice but to upgrade to a new Z170-based motherboard, as it uses a new CPU socket design called LGA 1151. As the name suggests it has an extra pin compared to the LGA 1150 socket used on the previous generation. The good

news is that most LGA 1150 coolers still fit the new socket perfectly; our Corsair H80i All-in-One cooler had absolutely no issue fitting onto the motherboards in our roundup.

One of the biggest changes between the Z97 and Z170 is an increase in bandwidth to the Platform Controller Hub (PCH), and in the last generation this link was known as DMI 2.0, which had a throughput of 5.0GT/s. Z170 now features DMI 3.0, which increases this bandwidth to 8.0GT/sec, and this is used to deliver extra bandwidth to the new

PCH, in the form of 26 Flex-IO ports. Each one of these ports can be used as PCIe lanes, USB 3.0 ports or SATA 6 ports. The first six lanes are dedicated to USB 3.0, leaving up to 20 to be used as PCI Express 3.0 lanes,

up from just eight lanes PCIe 2.0 lanes in Z97. The graphics lanes remain the same as Z97 however, with 16 PCI Express 3.0 lanes available, supporting x16, x8/x8 or x8/x4/x4 mode.

The new PCH also supports more, and faster, USB ports. Up to ten USB 3.0 and 14 USB 2.0 ports can now be run off the PCH. Throw in Gigabit Ethernet and a few M.2/SATAe ports for high-speed SSDs, and we run into a problem – despite the large increase in bandwidth to DMI 3.0, it's still not enough that it'll be possible to fill every PCIe lane, SATA and USB port without some serious performance issues. It's up to manufacturers to juggle exactly how these 26 Flex-IO ports are

utilised, but from a user's perspective we can look forward to some confusing illustrations in Z170 motherboard manuals, where utilising certain features will knock out other features. For example, each M.2 port eats up four of Flex-IO ports, which knocks out four PCIe 3.0 lanes, so filling three M.2 ports on a motherboard will likely disable some of the PCIe slots. If it all sounds a little confusing, it is, and buyers would do well to plan out their peripherals before going on a spending spree, calculating exactly how many lanes each device requires and whether their prospective motherboard can support it.

### MANDATORY MEMORY UPGRADE

The other major change between Z97 and Z170 is the introduction of DDR4 memory. While Z170 is theoretically capable of supporting DDR3 memory, the vast majority of Z170 boards will ship with DDR4 slots. This brings several benefits to the table, most important of all being a much lower operating voltage. Today's DDR4 modules run at just 1.2V to 1.35V, which should help save power in mobile platforms. As a result of this lower voltage, the DDR3 version of Z170 only appears to only support lower voltage DDR3L memory, which runs at 1.2 or 1.35V; we tried three normal kits of DDR3 in one such motherboard and it refused to boot, forcing us to remove it from the roundup.

Z170 officially supports DDR4 memory at a speed of 2133MHz with timings of 15-15-15 which brings us to the other major improvement over DDR3, in the form of higher performance. While the loose memory timings of DDR4 means it's slower than DDR3 when both are clocked equally, it has the potential to scale to much higher frequencies. Today's Skylake boards should hit DDR4 3200MHz relatively easily, and such kits only cost around \$260 for 16GB. Meanwhile garden variety DDR4 2122MHz

can be had for around \$150 for 16GB, a slight price increase over the same amount of DDR3.

While DDR4 is by no means a new memory type, we should point out the issues we had when testing Z170 motherboards. It seems they're rather particular about the memory kits they support, and several boards simply refused to work with either of our DDR4 memory kits. In the end we used Crucial's twin 8GB Ballistix Elite DDR4 memory kit as it worked with the most boards, but it meant we had to drop two boards from the roundup, as testing them with different modules would have skewed the benchmark results. Take it from us – if you're in the market for a Z170 motherboard, make sure you check the manufacturer's website for a list of compatible memory.

### FINE-GRAINED TWEAKING

If you're looking to overclock your new Skylake processor, the Z170 chipset is the only official option to do so. Given that the new i5-6600K seems happy to run at 4.5GHz, up from its default Boost speed of 3.5GHz, pairing this CPU with an affordable Z170 board could be a great way to get top-tier performance at a respectable price point. We wouldn't be surprised if motherboard manufacturers eventually release overclocking support on the upcoming H170 chipset, as they did so without Intel's permission on the H97 chipset in the past, but until then Z170 is the platform for tweekers.

The new chipset brings a couple of notable changes for overclockers. Firstly, the Skylake CPU has removed its integrated voltage regulation, which has now been passed back onto the motherboard. As a result, expect to see motherboard manufacturers making a song and dance about the number of power phases used to supply power to the CPU; generally speaking, the more phases there are, the more stable the power supply. By removing voltage regulation from the CPU, it should help the chip's temperature remain lower, and initial overclocking results suggest an overclocked i5-6600K runs around 15C cooler than its predecessor.

The other major change to overclocking is the ability to overclock by adjusting the BCLK, a feature that was removed

> Fun fact: both MSI and Gigabyte lay claim to having first come up with the 'Gaming' sub brand



several years ago. In the past couple of generations increasing the BCLK resulted in the PCIe and I/O buses running at higher speeds, causing the system to crash. However, in Z170 these are both locked at 100MHz, allowing the BCLK to be increased in 1MHz increments up to 200MHz. While multiplier overclocking remains the simplest and safest way to overclock, reintroducing BCLK overclocking could bring performance improvements over and above multiplier adjustments.

### I/O OPTIONS

We can finally say goodbye to ye olde VGA video output, as Skylake has officially removed this ancient interface, though motherboard makers can re-introduce it if they deem it necessary. Instead Z170 has three digital video controllers, in the form of one eDP 1.3 (embedded DisplayPort 1.3), DisplayPort 1.2 and a HDMI 1.4. Nearly all of the boards we tested had both HDMI and DisplayPort outputs, ready to utilise the improved integrated GPU of Skylake.

We've already mentioned the inclusion of USB 3.0 support, but there's been some confusing terms bandied about by different manufacturers regarding USB 3.1 offerings. It's not a part of the Z170 chipset, but most of these boards feature add-on controllers bringing USB 3.1 support to the table. Yet some makers refer to USB 3.1 and its 10Gbps of bandwidth as USB 3.1 Gen 2, while referring to standard 5Gbps USB 3.0 ports as USB 3.1 Gen 1.

Finally, Intel is rolling out a new Ethernet controller alongside Z170 in the form of the I219 controller. As expected it's a Gigabit port, but brings new power-saving enhancements to the table, which will likely only be noticed in mobile PCs. It remains compatible with Intel's existing Smart Connect technology, but for full vPro support buyers will need to get the I219-LM version, which is aimed at corporate users.



< Motherboards just get more and more attractive, don't you think?

# ASRock Z170 Extreme7+

## JAM-PACKED WITH EXTRAS

At a touch under \$400, ASRock is targeting serious performance users with the Extreme7+. The company has a healthy reputation of delivering over and above the competition at the same price point, so let's see just what \$400 gets us.

ASRock has made use of all those extra PCIe lanes, with four full-length PCIe 3.1 x16 slots. This gives it the necessary space to run quad graphics cards, and ASRock states that this is quad-SLI/CrossFire compatible. Three M.2 SATA connections reside amongst the PCIe slots, and they're all of the speedy PCIe Gen 3.0 x4 standard, offering up to 32Gb/s of throughput.

Twin LAN ports are included, and it's nice to see ASRock sticking with top-quality Intel controllers rather than the



cheaper Killer or Realtek offerings found elsewhere. A whopping 10 SATA 6 ports are included, but several of these double up to provide the three SATA Express ports. A couple of PCIe x1 slots are also included, along with a mini-PCIe slot. ASRock claims this board will easily hit a stable memory speed of DDR4 3600, but we didn't have the \$900 memory kit to prove it. Like all premium boards, ASRock reckons it has the best power supply for the CPU, using premium Nichicon capacitors in its 12-phase power system.

A single USB 3.1 type C connector sits next to another USB 3.1 type A connector, though ASRock doesn't advertise which controller it's using to power these. Rounding out the feature set is the Purity Sound 3 audio solution. Built around a Realtek ACL1150 audio chip, it uses Nichicon caps and a custom amplifier chip to deliver a claimed SNR of 115dB. It's not in the same league as Gigabyte's unique offering, but most users will be happy to drive a set of quality



neadpnonnes ott nris solution.

As far as performance goes, the Extreme7+ trailed the rest of the pack. Yet it's by such a small margin that we doubt the difference would be noticeable in the real world.

### KEY SPECS

\$389 • [www.asrock.com](http://www.asrock.com)

Z170 • Socket 1151 • 4 x PCIe 3.0 x16 slots (x8/x8/x8/x4) • 1 x PCIe 2.0 • 10 x SATA 6 ports • 3 x M.2 sockets

### OVERALL



# ASRock Fatal1ty Z170 Gaming K6

## THIS BOARD'S GOT NO GAME

Other than the fact that it's associated with a Quake player who won a bunch of money over a decade ago, what makes this board from ASRock worthy of the gamer tag in its title? As far as we can tell, very little, and overall it makes several sacrifices compared to the Extreme 7+.

Looking at the main specs, ASRock has endowed this board with three full-length PCIe x16 slots, along with another three PCIe x1 slots. ASRock claims this board supports quad-SLI, but we're not sure how it could do so with only three x16 slots, unless it was packing twin graphics cards, both equipped with twin GPUs.

The first so-called gaming feature is the inclusion of Killer's E2400 series LAN. This is actually cheaper than Intel's solution, and we've had issues with its QoS software in the past. Thankfully it's possible to run this without Killer's bloatware, in which case it should



perform ably. But it's not exactly the highlight that most manufacturers claim it to be.

The other gaming feature is another non-event, this time in the form of a "Fatal1ty" mouse port that supports polling of up to 1000Hz. We've tested this in the past on other ASRock boards, and found that it makes absolutely no difference to mouse accuracy, as most gaming mice already support this.

Just one M.2 port is available for SSDs, and it's of the PCIe 3.0 x4 variety. Eight SATA 6 ports are included, with the additional two powered by ASMedia's ASM1061 module, while twin SATAe ports are also included. Once again ASRock uses the identical Purity Sound 3 solution as found on the Extreme 7+ board, which is fine for gaming use.

The Gaming K6+ took out the unlucky position of last place in three of our four tests, but again we should emphasise that even at its worst it was only 7% slower than the fastest, averaging around 4% slower in the other tests. We're not sure we'd let that dissuade us from buying



this board. However, considering the Extreme 7+ offers much more features in the form of extra M.2 slots, SATA ports and PCIe slots, the Gaming K6+ doesn't look like such great value.

### KEY SPECS

\$318 • [www.asrock.com](http://www.asrock.com)

Z170 • Socket 1151 • 3 x PCI Express 3.0 x16 Slots (x8/x8/x4) • 3 x PCI Express 3.0 x1 Slots • 8 x SATA 6 ports • 1 x M.2 socket

### OVERALL





# Asus Z170 Pro Gaming

## OUR GAMING BOARD OF CHOICE

As the second cheapest board in the roundup, we were expecting Asus to have cut a lot of corners from this product. After all, Asus tends to be better known for its high-end offerings when it comes to gaming products. So we were pleasantly surprised when this budget-board ticked all the basics for a simple but powerful gaming platform.

Triple PCIe x16 slots provide ample room for multiple GPUs, while three more PCIe x1 slots deliver extra space for plenty of peripherals. A single M.2 socket is included, and it's placed well out of the way of the graphics cards, unlike other boards which cram them between PCIe lanes. Another SATA6e connection is included, and it doubles as twin SATA 6 ports, along with the other four, for a total of six.

Despite the low price tag, Asus has



seen fit to include USB 3.1 Type A and Type C ports, along with six USB 3.0 (four at rear, two via headers) and eight USB 2.0 (two at rear, six via headers) ports. Plenty of video outputs also feature, with the legacy VGA output sitting next to DisplayPort, HDMI and DVI. Talk about comprehensive. Rather than go with a cheap third-party Ethernet controller, Asus has used Intel's new I219V controller.

We love the graphical BIOS interface that Asus uses on its new boards, which shows all of the crucial stats in one easy-to-read glance. All of your basic controls and overclocking features are incredibly easy to use, with the option to switch to a traditional text based BIOS there for advanced users, though we did notice a little lag between pressing a key and it registering in the BIOS.

With the same claimed 115dB SNR as ASRock's products, we're guessing that Asus is also using the Realtek ALC1150 to power its SupremeFX audio solution. Like other companies, Asus boosts its



quality by including a premium amp and capacitors, along with EMF shielding from the rest of the board.

Scoring the top result in two of our benchmarks simply clinched the deal for this mobo – it's our pick for best value gaming solution on the market.

### KEY SPECS

\$279 • [www.asus.com.au](http://www.asus.com.au)  
Z170 • Socket 1151 • 3 x PCI Express 3.0 x16 Slots (x8/x8/x4) • 3 x PCI Express 3.0 x1 Slots • 6 x SATA 6 ports • 1 x M.2 socket

### OVERALL



# Asus Z170-Deluxe

## HALF A GRAND OF MOTHERBOARD

Welcome to the first, and only, board in our roundup to blast through the \$500 figure. At half a grand we expect this thing to not only play host to our new Skylake processor, but it should also cook our meals while it's at it. What has Asus crammed into this board to justify such a high price?

Once again we see Asus' beautiful BIOS in action, which is one of our favourites thanks to its clever depiction of the key pieces of info that system builders need. The external look of the board is just as pretty, with a sleek white design that'll look sexy in a modded case.

As far as extras, this thing is absolutely brimming with them. How about HDMI 2.0, one of the only boards in the roundup to feature it? Or perhaps you'd like twin Intel Ethernet ports to double your network speeds? Dual Band Wi-Fi is also included, and it uses a 3x3 design



to deliver up to 1300Mbps. Five USB 3.1 type A connectors sit next to a single USB 3.1 type C. Two adaptors are included; one is an M.2 to U.2 card that allows the installation of NVMe Express SSDs such as Intel's new 750 NVMe, while the other adaptor converts a PCIe slot into an M.2 mount. Speaking of M.2, there is only one on the board – we'd have appreciated more at this price point.

Also lacking is the number of full-length PCIe slots, with just three to be found here. However, there are four more x1 slots, so there's room for plenty of extras. Onboard audio is provided courtesy of the Realtek ALC1150 chip, used as the basis for this board's Crystal Sound 3 audio solution. Yep, it includes a custom amp and caps, yet the specs only list it as having a 112dB SNR, lower than its budget gaming board.

There are plenty of other features, but overall we're not sure Asus has done quite enough to justify the high price tag when compared to the likes of the ASRock 170 Extreme7+. At over \$150 more expensive it's got a few nice



additions such as HDMI 2.0 and Wi-Fi, yet the lack of M.2 and full length PCIe lanes is a little baffling.

### KEY SPECS

\$529 • [www.asus.com.au](http://www.asus.com.au)  
Z170 • Socket 1151 • 3 x PCI Express 3.0 x16 Slots (x8/x8/x4) • 3 x PCI Express 3.0 x1 Slots • 10 x SATA 6 ports; 1 x M.2 socket + 1 x M.2 Adaptor

### OVERALL



# Gigabyte Z170X Gaming 7

SOMETHING OUT OF THE ORDINARY

Don't let the name fool you into thinking this is yet another middle-of-the-road gaming board that ticks all the same boxes as the dozens of other gaming boards out there. Gigabyte has managed to incorporate a couple of exclusive features on this board that help it stand out from the pack, and go a long way to justifying its slightly higher price point.

The first feature is the exclusive use of Intel's new Alpine Ridge controller, which is the only Intel-solution to support USB 3.1. This has been used to power a single Type A and single Type C USB 3.1 port on the rear of the board, in addition to the five USB 3.0 ports found at the rear.

The other feature is the world's first 120dB SNR onboard audio solution. It's built around Creative's excellent Sound Core3D processor, but has been

improved via the use of high-end DACs and capacitors. We gave it a good listen with a set of high-end headphones and were extremely impressed – there's no difference between this and a good, dedicated sound card. Tweakers will appreciate the inclusion of water cooling across the heatsink solution, though newbies will probably find the text-based BIOS a little daunting compared to the pretty GUIs offered elsewhere, though Gigabyte said this will be upgraded by the time it hits retail.

Gigabyte has also equipped this with HDMI 2.0 out, along with twin Ethernet and Wi-Fi. That's excellent connectivity at this price point, but we should point out that the LAN ports and Wi-Fi are all supplied by Killer. There's even twin M.2 connectors, double that of boards that cost almost \$200 more.

Combine all these goodies with top-tier benchmark results, and Gigabyte is onto a winner. If you're looking for the best gaming board on the market, and don't



mind spending a little extra for it, we can't recommend this enough. In fact, we liked it so much, it's going into our new Skylake gaming rig along with an i5-6600K.

## KEY SPECS

\$369 • [www.gigabyte.com.au](http://www.gigabyte.com.au)

Z170 • Socket 1151 • 3 x PCI Express 3.0 x16 Slots (x8/x8/x4) • 3 x PCI Express 3.0 x1 Slots • 10 x SATA 6 ports • 2 x M.2 sockets • 2 x SATAe

## OVERALL



# Gigabyte Z170XP-SLI

A BUDGET CONTENDER

Y ouch. That's the thought that crossed our minds when we realised the most affordable board in our roundup still clocked the \$250 mark. It's worth noting though that the truly entry-level solution hasn't arrived yet, in the form of H170 boards, which should be substantially cheaper. At \$259 this board is the cheapest Z170 we've seen, so let's see if any of the basics have been missed in a bid to slash the price.

The arrangement of PCIe slots is pretty standard, with three full length PCIe slots and twin PCIe x1 slots. As the name suggests this board is capable of two-way SLI support, along with triple-CrossFire. However, the inclusion of another two PCI slots is very out of the ordinary, pointing to the legacy users this board is aimed at, who might want to bring their dusty old components with them. Yet they can also put one

foot in the future thanks to the single M.2 connector, while Gigabyte's ongoing support for SATAe means the inclusion of three SATAe ports isn't too surprising. Another six SATA 6 ports round out the drive options.

An ASMedia ASM1152 chip is included to power the single type C USB 3.1 port, which sits alongside another type A USB 3.1 port. Another three USB 3.0 and two USB 2.0 ports round out the USB offering, while DVI-I, VGA and HDMI 1.4 deliver three video outputs. An Intel controller powers the single Ethernet port, while Realtek's ubiquitous ALC1150 delivers sound. Unlike other solutions based on this audio chip, the version here doesn't appear to have been upgraded substantially, though Gigabyte does claim it's powered by higher quality capacitors.

Due to the early nature of our sample, it included the same text-based BIOS as the beloved Z170A Gaming 7, and Gigabyte reassured us that this will be updated to a snazzy GUI-based interface by the time it hits store shelves. It didn't seem to hurt performance at all, with this



board posting excellent results.

Despite being the cheapest motherboard here, we think this board has been pipped to the value post by the Asus Z170 Pro Gaming board, which is just \$20 more and seems to offer a few extra features to justify the extra twenty bucks. There's no denying the Z170XP-SLI is a solid board, and its PCI ports might make it worthy of consideration for some, but the Asus edges ahead in value.

## KEY SPECS

\$259 • [www.gigabyte.com.au](http://www.gigabyte.com.au)

Z170 • Socket 1151 • 3 x PCI Express 3.0 x16 Slots (x8/x8/x4) • 2 x PCI Express 3.0 x1 Slots • 1 x PCIe 3.0 x4 slot • 2 x PCI slots • 6 x SATA 6 ports • 1 x M.2 socket • 3 x SATAe

## OVERALL





# MSI Z170A Gaming M7

MSI DIALS IT IN

If you're old enough to remember the Turbo buttons that used to adorn the front of PCs, which would automatically increase the CPU frequency when pressed, you might appreciate the new Game Boost dial on this MSI motherboard. It's basically a rotating dial on the corner of the board, and as you rotate it, the board automatically overlocks the CPU to a faster frequency. As expected, it's not smart enough to beat a manual overclock, with our sample failing to boot up when set to the 4.6GHz position, which we know our chip is capable of doing.

Other than this unique feature, this is a rather stock-standard gaming board. The eye-catching design is suitably impressive, but there's nothing under the hood that makes us take note. Three full-length PCIe slots can house twin SLI or triple CrossFire cards, and they've

been reinforced with metal to stop cards wobbling. Yet we've never, ever had a problem with cards wobbling in the past, so it all feels like a feature just for feature's sake.

Another four PCIe x1 slots are present, along with twin M.2 ports. An optional U.2 adaptor allows for the installation of 2.5 inch U.2 SSDs. Twin SATAe ports are included, but they make up a whopping four of the total of six SATA 6 ports, giving this board fewer drive options than most. Twin HDMI 1.4 outputs are a handy inclusion, along with a single DisplayPort output. Considering the price, the single Killer Ethernet E2400 port seems a little underwhelming.

The Audio Boost 3 sound solution uses the same Realtek chip as the rest, but MSI has beefed up the surrounding componentry to deliver a capable audio platform for gamers. ASMedia appears to have supplied the USB 3.1 functionality, with both a type C and type A connection. Extra attention has been given to overclocking features, including onboard power and reset buttons, a debug LED



and our favourite, a clear CMOS button that can be accessed via the rear I/O panel.

We're left with a relatively basic gaming board that simply fails to match the heights of Gigabyte's Z170X-Gaming 7, despite costing slightly more. It's a good board, but in such a cluttered market that's simply not good enough.

## KEY SPECS

\$389 • [www.msi.com](http://www.msi.com)

Z170 • Socket 1151 • 3 x PCI Express 3.0 x16 Slots (x8/x8/x4)  
• 4 x PCI Express 3.0 x1 Slots • 6 x SATA 6 ports (3 x SATAe) •  
2 x M.2 socket

## OVERALL



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# Conclusion

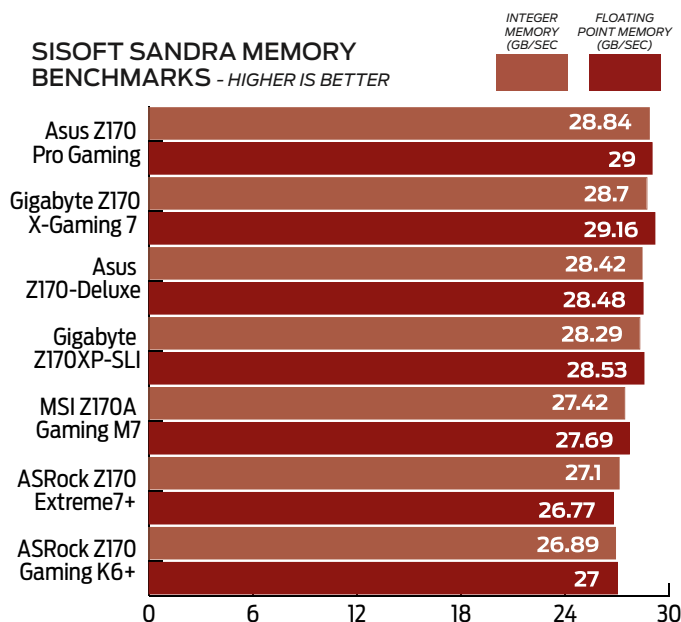
As mentioned earlier, there are a bewildering number of price points for Z170 motherboards, and most are higher than we expected. This could be a side-effect of the weak Aussie dollar combined with the extra features found on these boards. We invited the four big motherboard makers to submit both performance and value-oriented boards to our roundup, and were surprised to see how many sent in gaming-focused platforms, not to mention how expensive even the most affordable boards were. It seems that these manufacturers are keen to cash in on one of the few PC segments that is still experiencing healthy growth, but most of these gaming boards also double as excellent backbones for high-end PCs thanks to their abundance of extras.

## HOW WE TESTED

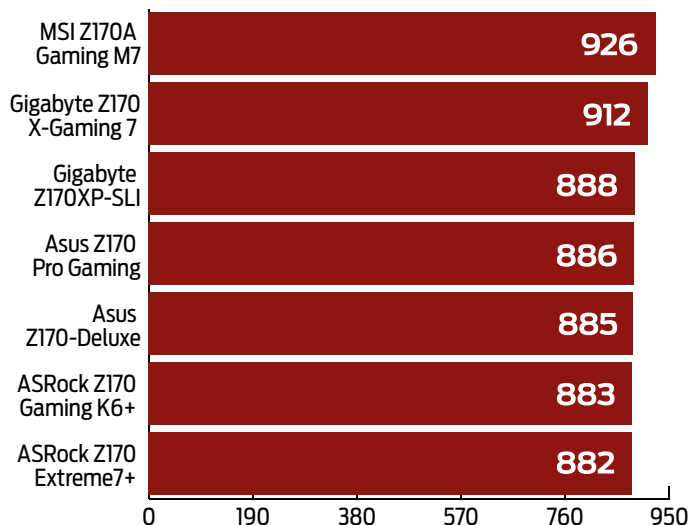
We used Intel's new I7-6700K CPU in all boards, along with twin sticks of Crucial's Ballistix Elite DDR4 memory running at stock timings of 15-15-15 at 2133MHz. Corsair's H80i took care of cooling duties, while a Corsair Neutron XT SSD hosted a fresh install of Windows 8.1 64-bit edition. We used onboard graphics for all tests, while a Corsair RM850i PSU delivered power to the system.

To test each board's performance we added a few new tests. SiSoft Sandra's memory benchmark is a great way to see which board has the best memory bandwidth, while the Cinebench and 7zip benchmarks both focus on overall CPU/chipset performance. Finally we ran 3DMark's Ice Storm Extreme test - this low resolution test places the emphasis on the CPU, RAM and motherboard, rather than the GPU.

### SISOFT SANDRA MEMORY BENCHMARKS - HIGHER IS BETTER

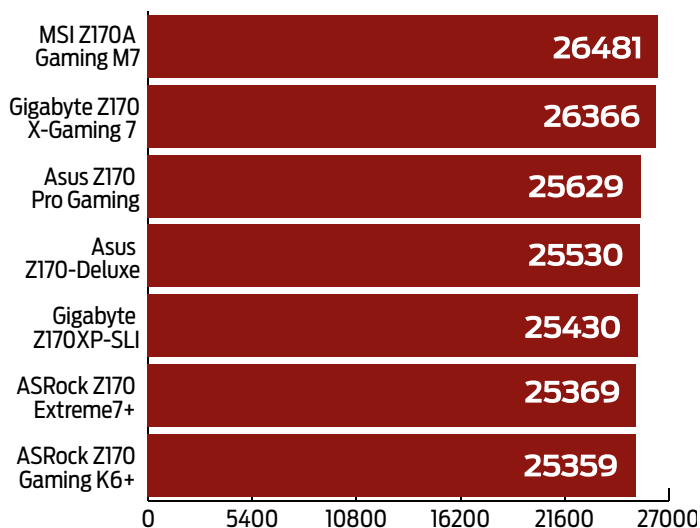


### CINEBENCH R15 CPU BENCHMARK - HIGHER IS BETTER

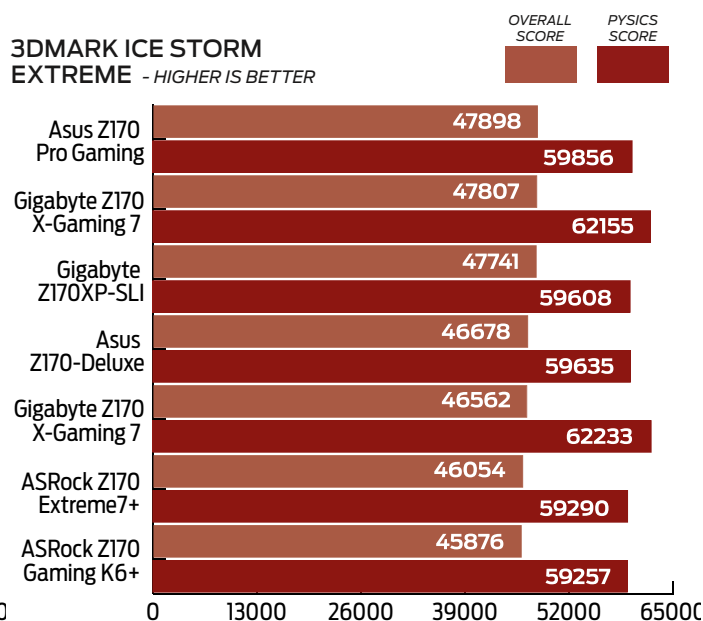


### 7ZIP BENCHMARK - HIGHER IS BETTER

TOTAL RATING (MIPS)



### 3DMARK ICE STORM EXTREME - HIGHER IS BETTER



# Skylake, Intel's latest secret partially revealed

**MARK WILLIAMS** TAKES A LOOK AT THE NEW PROCESSORS FROM INTEL BUT FINISHES WITH AS MANY QUESTIONS AS ANSWERS

Intel's latest desktop CPUs, codenamed Skylake-S, are finally upon us. Officially known as Intel's 6th generation of Core processors and benefiting from Broadwell's previous, very late, manufacturing node shrink down to 14nm of Haswell, this 6th generation focuses on bringing architectural improvements aimed at increasing performance through higher Instructions Per Clock (IPC), not just the higher clocks that a node shrink typically brings.

## TOUCH, BUT DON'T LOOK

Unfortunately, despite having launched two 6th gen CPUs already, Intel has been very tight lipped about exactly what they've done under the hood in Skylake since Broadwell. There's virtually no information available on the topic. Intel have instead chosen to withhold this information until their Intel Developer Forum (IDF) conference. Whether it's something ground breaking or they simply wanted some filler content for the conference, we simply won't know in time for this issue. So let's talk about what we do know.

The two CPU's that have launched in tandem with the matching Z170 motherboard chipset are the Core i7-6700K and Core i5-6600K.

## ENTHUSIASTS GET FIRST DIBS

Breaking from the tradition of the last few generations which started with laptop

focused CPUs launching first, these first two Skylake CPUs are entirely enthusiast-focused.

The i7-6700K can be viewed as a direct replacement of the i7-4790K. It has four hyper threaded CPU cores running at a stock base clock of 4.0GHz that can turbo up to 4.2GHz. That turbo is 200MHz less than the 4790K, however the architectural improvements since made over the 4790K should help the 6700K surpass it in most cases.

The i5-6600K effectively replaces the i5-4690K. It too has four CPU cores but like most i5 class processors it is missing hyper threading. It operates at a base clock speed of 3.5GHz with a turbo clock of 3.9GHz.

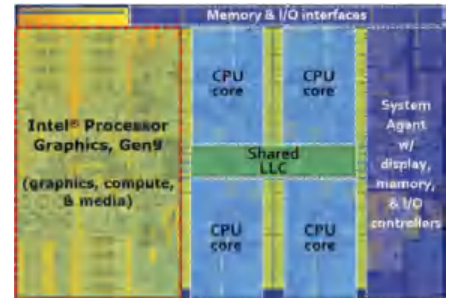
## THE PLOT THICKENS

Both are somewhat surprisingly rated at a 91W TDP, which is higher than the 84W of Haswell processors of two generations ago on the larger 22nm process node. While Intel is keeping its cards close to its chest for now on the nitty gritty of these new Skylake chips, the fact that the i7-5775C (Broadwell-DT) managed to shrink Haswell to 14nm, more than double the IGP size AND add 128MB of eDRAM yet still only draw 65W, shows that there is potentially a much higher transistor count in Skylake CPUs than what we might currently think.

To add further to the mystery, several things have been removed from Skylake

since Broadwell. Such as the audio subsystem which has now been completely shifted off to the Z170 chipset; the Flexible Display Interface (FDI); the fully integrated voltage regulators (FIVR) has also been moved off package to the motherboard;

< The block diagram of the Skylake + Z170 platform



▲ Die layout of the new Skylake processors.

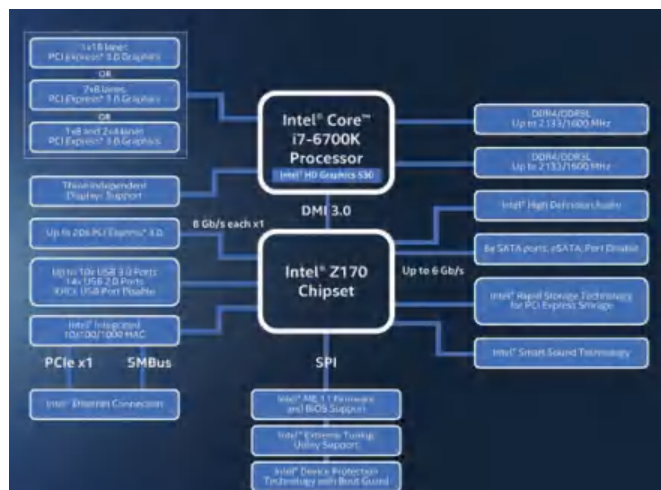
the introduction of DDR3L/DDR4 which operates at lower power envelopes; and the complete absence of eDRAM on these new processors over Broadwell-DT. It does make you wonder where all this extra 26W in power over Broadwell-DT is disappearing to because the initial performance results don't show any abnormally large gains.

## AN ACE UP THE SLEEVE

On the iGPU side of things both the 6700K and 6600K have a HD Graphics 530 (GT2) branded processor on board, which appears to be essentially the same as that of the HD Graphics 4600 (GT2) found in its Haswell Refresh progenitors. The only differences being that the maximum IGP frequency is now 50-100MHz lower at 1.15GHz but with an extra four Execution Units (EUs) on-board for 24 total over the previous 20 EUs leading to measurable increases in integrated graphics performance.

VGA connections are now no longer supported out of the box (although can be added with an active digital/anologue converter chip by motherboard makers). Interestingly it appears all of the 9th generation IGP's house an empty controller for an optional 64MB or 128MB of eDRAM (L4 cache). With the success of Broadwell-DT's eDRAM in boosting GPU performance, finally giving Intel the lead in the iGPU stakes versus AMD's offerings, it appears Intel has built in the option to add eDRAM into future CPUs to give them a decisive reply against anything AMD brings out in the short to medium term to press home Intel's advantage before AMD likely bring in new HBM-equipped Zen based APUs.

On a final note, both the i7-6700K and i5-6600K CPUs, in a first for Intel, do not ship with a heatsink fan cooler in the box. Being enthusiast-grade products with unlocked multipliers, the reasoning behind the omission is that buyers would likely be using 3rd party coolers anyway. And yes, your current 1150 socket cooler will work just fine with these new 1151 socketed CPUs.





# NAS



# Drives

PUT AN END TO LOST FILES AND FORGOTTEN BACKUPS:  
WE TEST EIGHT NAS DRIVES FOR THE HOME AND OFFICE  
THAT WILL SECURELY STORE ALL YOUR CRUCIAL DATA

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# Buyer's guide

NAS DRIVES CAN HANDLE A VARIETY OF TASKS, FROM PC BACKUP TO REMOTE ACCESS AND RUNNING A HOME MEDIA SERVER. HERE'S WHAT YOU SHOULD BE LOOKING FOR

Not every business needs a fully fledged server, and it would certainly be unusual if you had one at home. Often, it's the ability to share files across a network that drives people to purchase a server, particularly small businesses. But if this is all you need, you're better off with a network-attached storage (NAS) drive. A NAS drive is essentially a mini-server with the advanced capabilities stripped out – although many models allow you to add them back again via apps. This month we test ten NAS drives from some of the leading manufacturers in the field.

The most advanced NAS drives come in a rack-mountable chassis, intended to be installed in multiples or to supplement full servers in a dedicated rack. In this test, however, we're focusing on a selection of two- and four-drive standalone NAS devices aimed at small businesses and home users. These are intended to sit on your desk, on a shelf, or even on the floor somewhere, and are relatively small and unobtrusive.

When you are selecting such a device, the first question you need to ask is what you'll use it for. Will it be simply a network backup device or will it also act as a shared media server? Are there any other server-type uses you'd like to take advantage of? Then consider how much capacity you need, and whether you want room for expansion. Some NAS boxes are sold pre-populated, but others require you to supply disks yourself – and only selected drives will be compatible. Power consumption is important, too, since you'll most likely leave your NAS device on around the clock, so that it's available whenever you need it.

A key feature of a NAS is the ability to configure the installed disks in a variety of different ways. The options available on your device will depend on how many drive bays it has and how many of these are populated. With a two-drive device, the simplest options are to configure the drives as separate volumes, or to concatenate them into one logical drive: these arrangements are sometimes called "JBOD" configurations, which stands for "just a bunch of disks".

For most purposes, it makes sense to set up your drives as a RAID array (the name stands for "redundant array of inexpensive disks", although if you've invested in hefty 4TB volumes you might

quibble with the description). There are several options here, offering different balances of performance, capacity and security (see Choose the right RAID level, opposite page).

Beyond drive configurations, the networking features should be considered. All this month's devices have one or two Gigabit Ethernet ports, but the protocols they support vary a little. The most basic is Server Message Block

*"There's a good chance home users will want to use the NAS drive as a media server for all the devices in a network"*

(SMB), which allows Windows devices to access the storage over the network. Apple Filing Protocol (AFP) is Apple's equivalent, although OS X devices are SMB-compatible too, and Network File System (NFS) is the Unix/Linux equivalent.

HTTP compatibility is required if you want to access files over a web browser interface, while FTP support allows this protocol to be used to upload and download files. WebDAV is an extension of HTTP that allows writing as well as reading. For more enterprise-level connectivity, some of this month's devices support iSCSI, which allows the network drive to behave like an SCSI-attached local disk – beneficial for software that expects locally attached volumes.

## MEDIA SERVERS

Home users will be looking for a few different features. In particular, there's a good chance you'll want to use your NAS drive as a media server for all the devices in your home network. The core functionality here is UPnP/

DLNA compatibility, which is a widely used protocol for sharing video, music and pictures in a read-only fashion between devices. All of this month's NAS devices support it, and there are even smart TVs that can stream media in this way. For music lovers, iTunes compatibility means that the NAS device will conveniently show up automatically in your iTunes library.

Data backup from all of your network devices is likely to be the bread-and-butter task for a NAS server. A number of this month's entries come with backup software and multi-user licences, but if you're using OS X systems then support for Time Machine will be greatly beneficial. Some NAS manufacturers also offer apps for smartphones and tablets that you can use to access your files. You may want to share data outside your local area network. This is where the aforementioned HTTP, WebDAV and FTP support will be beneficial, although this can lead to security risks (see Securing your NAS device, p70).

Many of this month's devices also allow you to extend their capabilities by installing additional applications, including PHP frameworks that turn



> An intense fight for market supremacy has seen customers benefit over the last few years

these storage servers into general web servers for hosting blogs, forums, or even e-commerce sites. It's debatable whether it's wise to host such things from a NAS drive, but the option is there. Whatever you intend to use your NAS for, there's a huge range of options available, so study the reviews to find out which has the features to match your budget and needs.

## HOW WE TESTED

As well as comparing the features of each NAS device, we ran a series of performance tests on each of them, to simulate regular everyday usage scenarios. First of all, we measured the

best possible performance by copying a large 1.96GB single file to the device and back again. If you store a collection of audiovisual content, this will give you an idea of how quickly you'll be able to retrieve large video files.

For more general throughput, we copied a 10.6GB collection of smaller files to the NAS device, simulating backup operations.

All of these tests were performed across a Gigabit Ethernet network to minimise network bottlenecks, and the host system for copying was an Overclockers Renda PW-E7F workstation with fast SSD primary storage, again to ensure that the NAS setup was getting

the best data delivery possible.

For the same reason we used a Gigabit network, with only the NAS device, router and workstation on it. Using a power meter, we measured the number of watts consumed when the NAS device was idle and performing the multi-file backup test.

For the NAS devices that came without drives, we used the same set of 3TB WD Red hard disks – either two or four, depending on the model.

Since fault tolerance is more important than performance for a NAS drive, we configured RAID1 (mirroring) for two-drive devices, and RAID5 for four-drive devices.

## CHOOSE THE RIGHT RAID LEVEL

The RAID capabilities in these NAS appliances combine your physical disks to deliver better performance or greater reliability – or a balance of the two. But it's important to choose the right configuration for your needs.

### RAID0: STRIPING

With RAID0 – the simplest RAID “level” – when you save a file to your NAS, data is written to all disks simultaneously, a process called “striping”. In essence, using two drives in parallel provides twice the read and write performance of a single drive, and on a four-bay device speed can be increased further by using even more drives.

Because of the way striping works, all disks must be the same size. And a striped array can't normally be expanded after it's been set up, as this would require previously written data to be redistributed.

The biggest problem with striping, however, is that it's highly vulnerable to hardware failure. A two-disk system is twice as likely as a single drive to experience a failure in a given period, and if any one disk in a striped array fails, the entire contents are lost.

### RAID1: MIRRORING

RAID1 is the best choice when the safety of data is paramount. A complete copy of your data is written to each disk, figuratively making them all “mirror images”. Like striping, mirroring assumes disks of identical sizes, but the total storage available represents only the capacity of a single one,

and performance is no faster than for a single disk. But when one of your disks fails, mirroring comes into its own: the broken disk can simply be taken offline, and you can continue working as usual. You can even replace the failed drive with a new one and let the controller rebuild the array, restoring your original level of safety.

### RAID10: STRIPING AND MIRRORING

RAID0 and 1 suit different uses, but you can combine their advantages on a four-drive NAS device by “nesting” RAID levels. In RAID10, your four disks are set up as two mirrored arrays, and data is striped across them. This strikes a good balance of speed and safety: you get twice the speed and performance of a single drive, but if one drive fails then your data isn't lost.

### RAID5 AND RAID6: PARITY

Another option with more than two drives is RAID5. A four-disk RAID5 array offers the capacity of three disks, and uses the rest of the space to store parity blocks – check digits that are mathematically derived from the contents of the other three disks. These blocks make it possible to recover your data should any single disk fail, while at the same time – since the system can read from and write to all disks simultaneously – you get the speed benefits of striping. RAID6 adds a second parity disk,

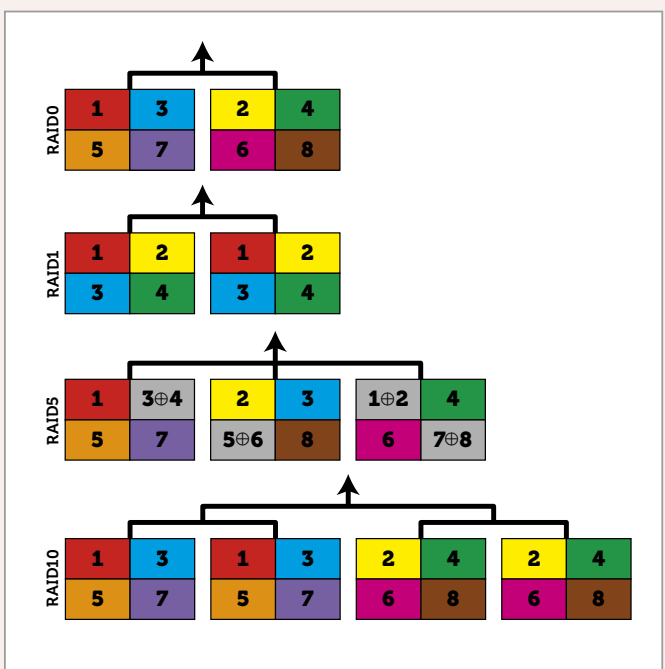
so two simultaneous disk failures can be accommodated. Since a more sophisticated parity system is used, data corruption can also be detected and corrected. For a four-bay device you might as well use RAID10, but RAID6 gets more efficient in larger arrays: in a 12-bay unit you could use 12 1TB disks to create a 10TB RAID6 array with two levels of redundancy, while the same disks in a RAID10 configuration would yield only 6TB of storage.

### WHAT ABOUT LEVELS 2 TO 4?

The original RAID specification, published in 1987, did specify

RAID2, RAID3 and RAID4, but these have proved surplus to requirements. RAID2 used a more complex parity system than RAID5, letting you mathematically determine which disk had failed; since modern disk controllers detect drive failures automatically, there's now no need for this.

Meanwhile, RAID levels 3 and 4 combine several striped drives with a single parity disk. This means you get the benefit of striped speeds when reading data, but the write speed of the array is bottlenecked by the speed at which the parity disk can be written to. Consequently, RAID3 and RAID4 aren't widely used.





	Asustor AS5002T	Asustor AS5104T	D-Link ShareCenter DNS-327L	Qnap TS-251	
OVERALL	★★★★☆	★★★★☆	★★★★☆	★★★★☆	
PRICING					
Part code	AS5002T	AS5104T	DNS-327L	TS-251	
Price	\$425	\$699	\$169	\$425	
Manufacturer	asustor.com	asustor.com	dlink.com.au	qnap.com/i/au	
Basic warranty <sup>1</sup>	3yr	3yr	1yr	2yr	
MAIN FEATURES					
Processor	Dual-core 2.4GHz Intel Celeron J1800	Quad-core 2GHz Intel Celeron J1900	1.2GHz Marvell Armada 370	Dual-core 2.4GHz Intel Celeron J1800	
RAM	1GB DDR3L	2GB DDR3L	512MB DDR3	1GB DDR3L	
Disks supplied	Diskless	Diskless	Diskless	Diskless	
Number of drive bays	2	4	2	2	
User-replaceable drives	✓	✓	✓	✓	
Hot swap	✓	✓	✗	✓	
Networking	2 x Gigabit Ethernet	2 x Gigabit Ethernet	Gigabit Ethernet	2 x Gigabit Ethernet	
Other ports	2 x eSATA; 3 x USB 3; 2 x USB 2	HDMI; S/PDIF	USB 3	HDMI; 2 x USB 3; 2 x USB 2	
iSCSI	10 LUN/10 targets	256 LUN/256 targets	✗	10 LUN/10 targets	
Network protocols	CIFS/SMB; AFP; NFS; FTP; WebDAV; rsync; SSH; SFTP; iSCSI; HTTP; HTTPS; SMB2; TFTP	CIFS/SMB; AFP; NFS; FTP; WebDAV; rsync; SSH; SFTP; iSCSI; HTTP; HTTPS; SMB2; TFTP	SMB; AFP; NTP; WebDAV	SMB; NFS; AFP; WebDAV	
FUNCTIONS					
Mobile applications	Android; iOS	Android; iOS	Android; iOS	Android; iOS	
External device support	✓	✓	✓	✓	
Media server functions	UPnP/DLNA; iTunes	UPnP/DLNA; iTunes	UPnP/DLNA; iTunes	UPnP/DLNA; iTunes	
Web hosting	✓	✓	✓	✓	
Managed backup	✓	✓	✓	✓	
Apple Time Machine	✓	✓	✓	✗	
RAID options	RAID0, 1, JBOD	RAID0, 1, 5, 6, 10, JBOD	RAID0, 1, JBOD	RAID0, 1, JBOD	
OS support	Windows XP and above; OS X 10.6-10.9	Windows XP and above; OS X 10.6-10.9	Windows XP and above; OS X 10.6-10.8	Windows XP and above; OS X 10.4-10.8	
Cloud services	Dropbox; Google Drive	Dropbox; Google Drive	Amazon S3; Google Drive	Amazon S3; Dropbox; Google Drive; Microsoft Azure	
Other	Surveillance camera support	Surveillance camera support	Surveillance camera support	Surveillance camera support	
PHYSICAL ATTRIBUTES					
Dimensions (WDH)	108 x 230 x 164mm	170 x 230 x 186mm	90 x 195 x 144mm	102 x 225 x 169mm	

	LABS WINNER – 4-BAY		LABS WINNER – 2-BAY	
	Qnap TS-453mini	Seagate NAS 2-Bay	Synology DiskStation DS215+	Synology DiskStation DS715
	★★★★☆	★★★★☆	★★★★☆	★★★★☆
TS-453mini-8G	STCT8000200	DS215+	DS715	
\$789	\$400	\$459	\$589	
qnap.com/1/au	seagate.com	synology.com	synology.com	
2yr	3yr	2yr	2yr	
Quad-core 2GHz Intel Celeron J1900	1.2GHz ARM processor	Dual-core 1.4GHz Annapurna Labs Alpine AL-212	Quad-core 1.4GHz Annapurna Labs Alpine AL-314	
8GB DDR3L	512MB DDR3L	1GB DDR3	2GB DDR3	
Diskless	2 x 4TB Seagate ST4000VN000	Diskless	Diskless	
4	2	2	2	
✓	✓	✓	✓	
✓	✓	✓	✓	
2 x Gigabit Ethernet	Gigabit Etherne	2 x Gigabit Ethernet	2 x Gigabit Ethernet	
eSATA; USB 2	USB 3; USB 2	eSATA; 2 x USB 3	eSATA; 2 x USB 3	
32 LUN/32 targets	10 LUN/10 targets	10 LUN/10 targets	10 LUN/10 targets	
SMB; NFS; AFP; SFTP; NTP	SMB; NFS; HTTP; HTTPS; FTP; SFTP; WebDAV	SMB; AFP; NFS; SFTP; SSH	SMB; AFP; NFS; SFTP; SSH	
Android; iOS	Android; iOS	Android; iOS; Windows Phone	Android; iOS; Windows Phone	
✓	✓	✓	✓	
UPnP/DLNA; iTunes	UPnP/DLNA; iTunes; MTP/PTP	UPnP/DLNA; iTunes	UPnP/DLNA; iTunes	
✗	✓	✓	✓	
✓	✓	✓	✓	
✓	✓	✓	✓	
RAID0, 1, 5, 6, 10, 5 + hot spare, JBOD	RAID0, 1, JBOD; Seagate SimplyRAID	RAID0, 1, JBOD; Synology Hybrid RAID	RAID0, 1, JBOD; Synology Hybrid RAID	
Windows XP and above; OS X 10.5-10.8	Windows XP and above; OS X 10.6-10.9	Windows XP and above; OS X 10.6-10.8; Linux	Windows XP and above; OS X 10.6-10.8; Linux	
Amazon S3; Dropbox; Google Drive; Microsoft Azure	Amazon S3; Box	Amazon Cloud Drive; Amazon S3; Baidu Cloud; Box; Dropbox; Google Drive; hubiC; MegaDisk; OneDrive; Yandex; WebDAV	Amazon Cloud Drive; Amazon S3; Baidu Cloud; Box; Dropbox; Google Drive; hubiC; MegaDisk; OneDrive; Yandex; WebDAV	
Surveillance camera support; IR remote control	Surveillance Manager (NVR)	Surveillance camera support	Surveillance camera support	
151 x 200 x 210mm	217 x 173 x 120mm	104 x 232 x 157mm	104 x 232 x 157mm	





< The DS215+ boasts great features for both home and small-business use

within the main window, but some open in their own tab, such as the Surveillance Station for monitoring and recording from IP cameras.

Synology has a sizeable database of installable packages, although not quite as large as Qnap and Asustor have on offer. There are options to set the device up as a mail server, Magento, osCommerce or PrestaShop e-commerce website, WordPress blog and many more. In fact, this is virtually a web appliance rather than a mere NAS device.

The DS215+ has plenty of media features, too. You can easily enjoy your collection from a browser window, or connect to the device with a DLNA-compatible player (such as a smart TV) and access the content that way. But there are equally capable professional facilities, including support for joining domains, LDAP and single sign-on clients. You can set up the DS215+ as an iSCSI device with up to ten targets, so it should fit comfortably into a corporate environment.

Costing \$459 for the bare device without drives, the Synology DS215+ isn't a low-budget option. However, it's one of the quickest NAS drives you can buy, particularly when backing up large numbers of small files. There's also a huge range of extra applications you can install to extend the functionality, and a good selection of professional features built in. The DS715 might be a little quicker in some areas, but it's not worth the extra \$130 unless you do a lot of multi-file backups. The DS215+ is our two-bay NAS device of choice this month.

#### OVERALL



# Synology DiskStation DS215+

EXCELLENT PERFORMANCE, BUILT-IN PRO FEATURES AND HUGE APP EXTENSIBILITY MAKE THIS WORTH THE ASKING PRICE

Synology is one of the most popular brands for NAS devices, with a truly huge range available. The DiskStation DS215+ is a premium two-drive model, with several features that lift it above the more consumer-orientated options. There are two lockable hot-swap drive bays on the front, with two USB 3 ports and two Gigabit Ethernet ports plus eSATA on the rear. There's a hefty 92mm fan on the rear as well, to ensure the hard disks remain cool.

The dual Gigabit Ethernet links can be used for failover or link aggregation, with the latter improving performance. This could well be worth taking advantage of in order to squeeze as much out as possible, since the DS215+ is one of the fastest NAS drives this month. Synology claims the dual-core 1.4GHz Annapurna Labs Alpine AL-212 processor provides superior performance, and where writing is concerned our tests bear this out.

Backup performance was particularly

impressive. The DS215+ took less than half the time of some of its competitors to back up our 10.6GB dataset. Only Synology's quad-core DS715 beat it at this test. This is sure to be a productivity boost, and will make you much more likely to back up on a regular basis. Throughput when writing a large single file was actually faster than the more expensive DS715's at 107MB/sec, although it was beaten by several others in our reading test.

Once your hard disks are installed and the DS215+ is powered up, a simple wizard guides you through configuration and then takes you to the management interface. This is an attractive graphical affair, with a handy configurable widget window in the bottom-right corner, providing CPU, RAM and storage-utilisation readouts. The main menu is found via an icon in the top-left corner, which calls up all the packages you have installed. Most of these open as windows





< The TS-453mini is packed with features

view content.

If you've chosen the consumer option, the TS-453mini will have apps for photo, music and video sharing, as well as for taking advantage of the HDMI port. There's built-in antivirus too, and the unit will act as storage for a network IP surveillance camera. There's a huge selection of apps available, including cloud backup support for Dropbox, Google Cloud Storage, various Amazon S3 resellers, Microsoft Azure and a number of others. You can set up the TS-251 as a web server for e-commerce platforms including PrestaShop, OpenCart, and Zen Cart. WordPress, Joomla, Drupal, phpBB and MediaWiki (as used by Wikipedia) can be installed too.

The TS-453mini isn't short on features, then, but it also offers an admirable turn of speed, thanks to its quad-core 2GHz Intel Celeron J1900 and 8GB of DDR3 memory (there's a cheaper 2GB memory version available too). Its write performance with a single large file was the second fastest on test, and its read speed surpassed all others at 110MB/sec. Only the two Synology systems could beat it in the multi-file backup test. If you want a quick backup to huge amounts of RAID5-protected storage, then this device won't disappoint.

The one downside with the Qnap TS-453mini is its price. At almost \$789, it's pricey when you consider that it comes without any storage. Nevertheless, it has the fastest overall performance, good features and great app extensibility. This is a super-quick and comprehensively specified NAS device.

#### OVERALL



## Qnap TS-453mini

SUPERB PERFORMANCE AND FEATURES MAKE THIS A HIGHLY RECOMMENDED NAS DEVICE, ALTHOUGH IT'S PRICEY

The TS-453mini is Qnap's four-drive entry this month, and, unlike other manufacturers' offerings, the design is completely different to the company's two-drive model. Instead of the front-loading hot-swap system of the TS-251, this chassis loads drives from the top. They're not secured behind a lockable cover, instead, a magnetised panel sits over them, making this a more consumer-friendly device in appearance. You have to be careful not to pick it up by its lid, though, as this will simply detach.

The TS-453mini has something to tempt every type of user. Initial startup allows you to choose whether you're a home or business user; this seems only to affect whether the media applications are installed by default, however, and they can be manually added later anyway. The web interface is exactly the same for either business or home, and the same as on the TS-251. The TS-453mini also sports a HDMI port on the rear so you can use it as a media player.

While the non-lockable lid is a worry for business users, this device uses tool-free rails for hard disk installation, making it a doddle to add disks or swap out a faulty drive. There's no LCD on the front to provide extra information, but the web setup proved to be pretty painless. There's a utility for this, but you can simply find the IP address of the device and point a browser at it – the rest is just a few clicks and tickboxes.

The web-management menu provides an iPhone-like array of icons to access the various functions. Once you delve into the control panel, there's a lot of detailed configuration available. RAID levels include 6 and 5 + hot spare, as well as the 0, 1, 10 and 5 options you'd expect from a four-drive NAS device. You can migrate between RAID levels without losing data, and there's support for a comprehensive range of network protocols.

There's a whole host of mobile apps for iOS and Android too, from which you can manage the NAS, download files, and

# Asustor AS5002T

A PROMISING NAS DEVICE WITH PLENTY OF FEATURES AND CONNECTORS, BUT LARGE-FILE READING LETS IT DOWN

Asustor is a relatively new player in the UK market, but from the look of what it has to offer this month, the company has considerable potential.

The AS5002T is a two-drive NAS device with a sober grey-and-black chassis. The front bays are hot-swappable, although you can't lock them shut to prevent tampering. You also have to screw the hard disks in place, instead of using a faster tool-free design.

When it comes to connectivity, the AS5002T is hard to beat. There's a USB 3 port on the front and another two on the rear, plus a pair of USB 2 connectors and a pair of Gigabit Ethernet ports. There are also two eSATA ports, plus HDMI and optical S/PDIF. The affords extra expansion for home-office users, alongside facilities geared towards a home media server.

As with many NAS devices these days, the main web interface uses a row of icons, and the submenus

aren't so full of options that they become confusing. There's an app infrastructure available, with a sizeable array of software you can download and install. This includes Avast Anti-Virus, which is welcome as no antivirus is installed by default. There are useful corporate functions such as the ability to configure the NAS device as an iSCSI target and to balance the load on the Gigabit Ethernet ports.

With its dual-core 2.4GHz Intel Celeron J1800 and 1GB of DDR3L memory, the AS5002T has performance potential. Unfortunately, this was never fully realised in our testing. It performed well when writing a single large file at 88MB/sec, but reading was by far the slowest in this month's selection, at only 56MB/sec. The AS5002T fared better with our large collection of smaller files, recording a better-than-average time.

The Asustor AS5002T is a capable NAS device, and at less than \$430, it's



2-BAY

▲ The AS5002T is reasonably priced for small businesses

reasonably priced for small businesses. Its large-file reading speed lets it down, costing it an award this month by a very narrow margin.

OVERALL



# Asustor AS5104T

A CAPABLE FOUR-DRIVE NAS WITH A WEALTH OF FEATURES AND DECENT PERFORMANCE AT A PALATABLE PRICE

The Asustor AS5104T definitely looks like the bigger brother to the AS5002T, and similarly its hot-swap caddies are actually interchangeable – although the AS5104T's caddies include a little screwlock to prevent idle hands from casually popping out a drive. Someone with a screwdriver could still remove one, but at least you can be protected against petty fiddling in an office environment.

Apart from the extra drive bays and space to accommodate them, the chassis offers the same features as the AS5002T. There's a USB 3 port on the front and two more round the back, plus two USB 2 ports, two eSATA and two Gigabit Ethernet ports, as well as HDMI and optical S/PDIF audio. The LCD panel and associated buttons on the front are welcome additions: aside from providing useful information about the status of the device, these also allow you to perform functions such as initialising new disks or restarting the system.

The Asustor setup routine doesn't provide much feedback about progress but the main menu is one of the more

user-friendly. The icons lead to submenus that don't overload you with options, but still offer plenty of configuration, such as load balancing the twin LAN ports or mapping iSCSI LUNs. There's an extensive library of apps you can download and install onto the device, which will turn this NAS device into all manner of web and media servers.

Asustor has beefed up the internal specification over the AS5002T, with a quad-core 2GHz Intel Celeron J1900 and 2GB of DDR3 memory. This propelled the AS5104T to some of the best performance scores this month. It was third quickest when writing a large file with a speed in excess of 100MB/sec, although reading it back was a little slower than with the fastest devices, slipping below the 100MB/sec threshold.

The speed at which the AS5104T backs up multiple small files is also decent, although the Qnap TS-453mini beat it here, as did both Synology models. Indeed, it's only marginally faster than its far cheaper sibling in this test.



4-BAY

▲ Screwlocks will protect against petty fiddling in an office environment

It's also worth noting that the AS5104T is one of the more power-hungry devices on test this month. At peak load, for example, it drew 31W.

Overall, though, the Asustor AS5104T offers a good balance of performance, features and value.

OVERALL



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- Back up your PC and Mac
- Works with Windows, Mac, iOS, Android, and Windows Phone



DS215+

DS715 Up to 7 HDDs with expansion unit

**Synology**  
2016

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\* Food and drinks will be served.



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# D-Link ShareCenter DNS-327L

A POOR PERFORMER, BUT IT'S THE CHEAPEST NAS DRIVE ON TEST - WORTH CONSIDERING IF YOU'RE ON A TIGHT BUDGET

There's not much more to the DNS-327L than a plastic box with a metal hard drive cage inside and a PCB at the bottom; this is a consumer-orientated unit. The drives aren't hot-swappable, but installing them is still relatively easy. Unhook a plastic lid from the top and install loops onto the drives. They'll then slide in with SATA and power connections at the bottom. Alongside power, there's one USB 3 port and a Gigabit Ethernet port on the rear.

Despite the minimal hardware, the D-Link has a decent selection of features once you delve into the web-based management interface. The twin discs can be configured as RAID0, 1 or JBOD. You can also migrate a single drive to a RAID1 configuration. The USB port can provide print-server capabilities or UPS monitoring, or can be used to connect external storage. Media-streaming options are comprehensive, with DLNA H.264 and iTunes, and there's support for IP security cameras too.

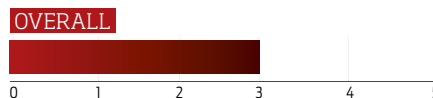
Like others this month, the DNS-327L can be extended with downloadable apps, although this system isn't as easily extensible as, say, Seagate's. However, there are genuinely useful options here, including WordPress blogging, phpBB forums and the Joomla platform, which will turn the D-Link into a mini web server. You can also download directly to the device via FTP, HTTP or BitTorrent P2P, and back up to Amazon S3 or Google Drive cloud storage.

The 1.2GHz Marvell Armada 370 processor and 512MB of RAM is paltry compared to others this month, and the DNS-327L's performance proves that you get what you pay for. Writing speed with a single large file was among the slowest this month, although reading was a little better at 89MB/sec. Backing up multiple small files placed the D-Link bottom of the pack, with a speed of only 13MB/sec.

But the DNS-327L is much cheaper than any other drive on test, making it worth considering if you're on a budget.



▲ The D-Link is the cheapest device on test



# Qnap TS-251

A CAPABLE NAS DRIVE, BUT SLOW WRITING PERFORMANCE PUTS IT OUT OF THE RUNNING FOR AN AWARD

Qnap is one of the many Taiwanese vendors producing NAS devices. The TS-251 is a mid-range, two-drive option aimed at home and small-office usage. Two hot-swap bays are located on the front, although the caddies are entirely made of plastic, and don't have a lock to prevent removal.

Although the TS-251 does have business pretensions, it's clear from the attractive white finish and hardware features that this is primarily a consumer device. Confirming this is the HDMI port, which, in tandem with the appropriate software, will allow you to use the TS-251 to watch downloaded video, or even live and recorded TV with the appropriate hardware adapter.

There's a USB 3 port on the front, making it easy to plug in a flash drive or external hard disk. There's a second USB 3 and a pair of USB 2 ports on the rear, and all USB ports support printers, Wi-Fi adapters and UPS control. There are also two Gigabit Ethernet ports to play with.

There's a huge range of installable apps

available, from cloud storage to PHP-based web platforms. A number of USB digital TV tuners are supported, and you can install a couple of different control and recording apps. There's Surveillance Station for IP cameras, Moodle for creating your own education server, and home-automation apps too.

More good news for home users is the TS-251's parsimonious power consumption. When sitting idle, it uses only half the energy of its sibling, the Qnap TS-453mini, at only 16W – and uses only a couple of watts more when under peak load.

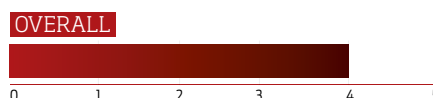
With a 2.4GHz dual-core Intel Celeron processor onboard, the TS-251 promises a decent turn of speed, although our review sample offers only 1GB of DDR3 memory (there's a more expensive 4GB version available). Performance was erratic in our tests. Its large contiguous file writing performance wasn't stunning, representing one of the slowest results this month at only 56MB/sec – yet read performance was the second quickest, at



▲ The TS-251 is one of the least power-hungry devices on test

109MB/sec. Multi-file backup was in the middle of the pack, at 20MB/sec.

Pricing is similarly middle of the range. Overall, this is a decent NAS device with a fair range of features.



# Seagate NAS 2-Bay

THE SLOWEST DEVICE ON TEST OVERALL, BUT WITH 8TB OF STORAGE INCLUDED IT IS AT LEAST GOOD VALUE

As one of the leading hard-drive manufacturers, Seagate is hardly a surprise entry this month. Its business NAS range includes two- and four-drive options; our sample was the two-drive version. This is a serious-looking black box with twin hot-swap bays on the front. Only a single Gigabit Ethernet port is available, but there are USB 3 ports front and back.

The 2-Bay is available with 4TB, 8TB or 10TB of storage. Ours was the medium option, sporting a pair of 4TB Seagate ST4000VN000 drives; these are NAS-specific units rated for 8,670 power-on hours (around one year) and one million hours of MTBF, with a three-year warranty. The drives can be configured as RAID0, 1 and JBOD.

The web configuration interface is user-friendly, with decent features. Network-protocol support is comprehensive, with SMB, NFS and AFP all present, alongside HTTP and HTTPS, FTP, SFTP and WebDAV. There's 10-

LUN/device iSCSI support, making the 2-Bay fit for more corporate environments.

There's an open API for third-party apps, which can be installed via the web interface. Seagate's apps include antivirus, a surveillance manager for attached IP cameras, and a cloud backup manager. There's a Plex app to turn the NAS into a media server, BitTorrent Sync, and the WordPress blogging platform, among others, making this a flexible and general-purpose NAS. Overall, though, the app selection isn't as extensive as some other manufacturers'.

With a 1.2GHz ARM processor and 512MB of DDR3 memory, this isn't the meatiest NAS in terms of hardware, and it shows in the performance. The 2-Bay was the slowest when writing the large file at only 54MB/sec – less than half the speed of the fastest drives – although performance was much more acceptable when reading it back. It was particularly



▲ This business NAS is a serious-looking black box

slow for the multi-file backup. It's not all gloom for Seagate, though: the two 4TB hard disks would set you back around \$500 on their own, so it's decent value despite the speed shortcomings.

OVERALL



# Synology DiskStation DS715

DECIDEDLY FAST, BUT IT'S THE MOST EXPENSIVE DISKLESS TWO-BAY NAS DRIVE ON TEST

The Synology DiskStation DS715 is almost identical to the DS215+. It's a two-drive chassis with the same design. There are two hot-swap bays on the front, which can be locked shut with an Allen key. We'd recommend doing so: they're a bit too easy for casual office thieves to pop open with a simple push otherwise.

On the rear can be found a couple of USB 3 ports and a pair of Gigabit Ethernet ports, plus eSATA. A front-facing USB 3 port would have been useful, and there's no HDMI, but neither are essential.

When it comes to the software, Synology has the balance right between features and usability, with both Basic and Advanced modes available. There's a comprehensive selection of downloadable apps, including a capable IP camera surveillance tool and antivirus, and web-server PHP frameworks, although the selection isn't as extensive as some manufacturers'.

Where the DS715 differs from the DS215+ is in the core hardware specification. Instead of a dual-core

1.4GHz Annapurna Labs Alpine AL-212 processor with 1GB of DDR3 memory, there's a quad-core 1.4GHz Annapurna Labs Alpine AL-314 processor with 2GB of DDR3 memory. In theory, this should make the DS715 faster than the DS215+, particularly with processor-intensive tasks, but our benchmark tests revealed that the superior hardware didn't make a huge difference.

When writing a large file, the DS715 was one of the fastest at 103MB/sec, although the DS215+ was marginally quicker in our testing. In the all-important multi-file backup, the DS715 reigned supreme: it was noticeably quicker than any other NAS device this month, and more than twice as fast as some at 33MB/sec. Unfortunately, as with the DS215+, large-file reading performance wasn't so stunning – the DS715 delivered a below-average speed of 81MB/sec, marring an otherwise impressive show in our benchmarks.

The Synology DiskStation DS715 is the most expensive two-bay diskless NAS drive on test this month. It may be



▲ Despite more impressive hardware, there isn't a huge difference between the DS715 and its cheaper sibling

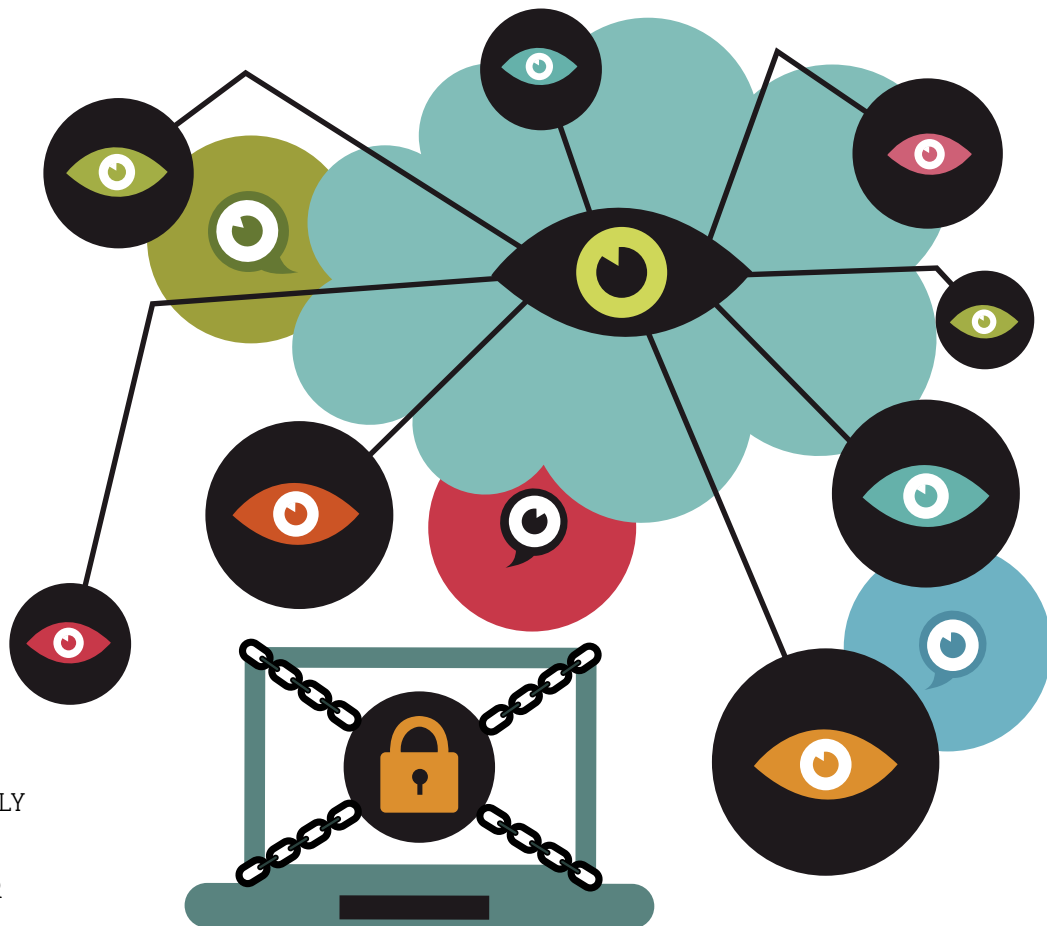
blisteringly quick at backing up smaller files and copying across larger ones, but the DS215+ is almost as quick and \$130 cheaper, making it the more sensible two-drive choice.

OVERALL



# Securing your NAS drive

BEING ABLE TO ACCESS YOUR DATA FROM ANYWHERE IS HUGE EMPowering, BUT IT BRINGS WITH IT AN ELEMENT OF RISK. WE EXPLAIN HOW TO KEEP YOUR PRECIOUS FILES SAFE



The key advantage of a NAS drive is the ability to access your data from across your network, and even over the internet – otherwise you may as well just add a few extra hard disks to your desktop system. But making your data visible over the internet also puts it at risk. Unlike additional hard drives in an existing computer, NAS storage won't be protected by a computer's antivirus, anti-malware or firewall provisions. It needs protections of its own.

This was brought to the fore around a year ago, when some unlucky users of Synology products tried to access their NAS devices only to be met with a disturbing message purporting to be from "SynoLocker". This stated that all the files on the device had been scrambled with strong cryptography, and they eventually discovered they would have to pay 0.6 bitcoins (around \$200) via the Tor network to get the key to retrieve their files. This is known as a "ransomware" attack, and what was particularly worrying was that it didn't come from a rogue trojan running on a local system – it was caused by the SynoLocker scammers directly attacking Synology devices they found visible on the internet. (Synology quickly fixed the vulnerability in its operating systems, so neither of the

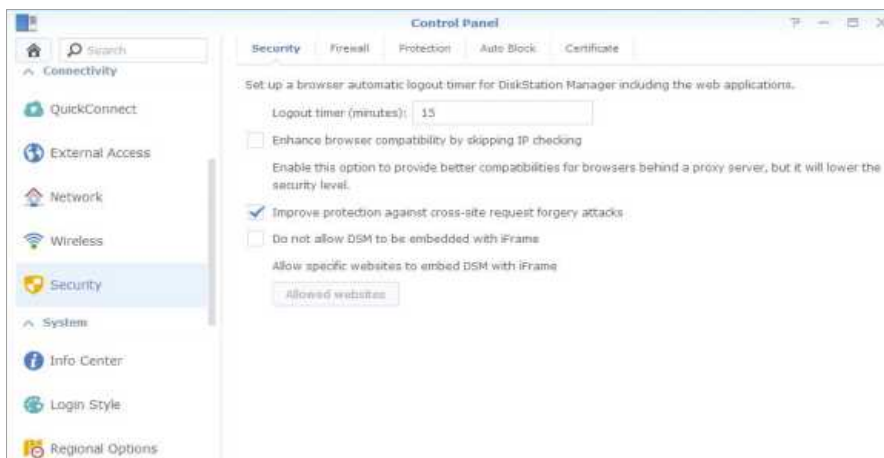
company's devices on test this month are susceptible.)

When there's a known exploit in the software used to run a NAS device, it can be pretty hard to do anything about it until the developer of the software has fixed the problem. But there are many steps you can take to protect your device and the data held on it from opportunistic attacks, and also so that it doesn't become a beachhead for attacks on other systems on your local network.

Despite the possibilities for the latter, we haven't heard of any significant attacks to local networks from exploited NAS devices. Netgear ReadyNAS devices

were shown to be vulnerable in 2013, giving access to stored data that might make other systems on the network vulnerable. In October, Qnap released a patch to counteract the ShellShock attack on its devices' Linux OS, which could also be used as a way to find other vulnerable devices on the local network. Many of these vulnerabilities are technical possibilities discovered by researchers rather than examples of users being hacked, though.

A compromised broadband router is a much more dangerous proposition. The primary concern is for the NAS itself and the data contained therein. It may seem



> It's worth exploring your NAS drive's security settings



like a good idea to put your NAS drive inside the router's demilitarised zone (DMZ), as you won't need to set up port forwarding to expose its services to the outside world. However, this is a bit like leaving your jewellery lying in the street. The NAS should be kept behind your router's firewall and only the necessary ports should be forwarded to it, such as 80 or 8080 for HTTP, and 21 for FTP. Only open and redirect the ports you actually need – if you don't plan to use FTP, don't forward that port.

## TAKING CARE OF ADMIN

Another sensible step is to create a new administrator account on your NAS device with a non-standard username (so not "admin", "administrator" or "support"), and then disable the default admin account. This way, anyone trying to gain entry will have to guess your username as well as your password.

Some NAS device software allows you to force users to set strong passwords – for example, preventing the username or part of the description being used in the password, and forcing the user to include at least one numeric and one special character. It may also be possible to enforce a minimum password strength. Where available, you can set up user accounts with greatly reduced service availability, to limit any damage from compromise, and only use the administrator account when actually performing administration. There may be an option to block an IP address after a set number of failed login attempts over a certain period of time.

Synology devices even offer two-step verification using Google Authenticator (Android/iOS/BlackBerry) or Authenticator (Windows Phone) mobile

✓ Amazon S3 is supported by a number of this month's devices



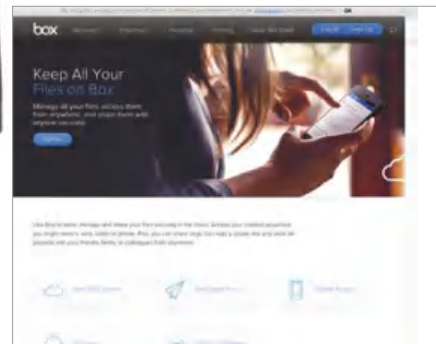
▲ A compromised broadband router will put your NAS drive in danger

apps. The process displays a key on your mobile device, which you then use to log in to the NAS drive. An assailant would need your smartphone and your username and password to get into your account. Some devices, such as Qnap's, have specific network access protection tools that log activity and let you block any IP addresses that appear to be attempting nefarious activities. It will usually be possible to turn off services

*“NAS storage won't be protected by a computer's antivirus, anti-malware or firewall provisions”*

you don't use, too. Many NAS devices even have their own built-in antivirus software, or make it available through an installable add-on.

Devices that support HTTPS or SFTP will allow web and FTP access with SSL/TLS encryption. If it's possible to enable this and disable the unencrypted HTTP/FTP alternatives, much greater privacy and security will be available. For remote administration, it's highly recommended that you turn on SSL for



▲ It's a good idea to keep a backup of your files on a cloud service such as Box

system administration, where available, so that all web-based configuration activities are encrypted. As a corollary to this, if you're using a public computer to access the web interface, put the browser in Incognito Mode (Chrome) or Private Browsing mode (Firefox). This means cookies and logins won't be remembered by that browser, and nor will your browsing history – so the next user won't have easy access to the location of your NAS drive's web interface.

At the device level, you should always use a fault-tolerant RAID option, even though this will reduce the amount of storage available below the native capacity. For a two-drive NAS, this would be RAID1 mirroring, and for three or more drives we'd recommend RAID5, for reasons we explained earlier. If you're really worried about losing your data, it's worth backing up your NAS drive from time to time to another external device that you keep locked away. This means that even if someone physically steals your NAS drive, your data should theoretically be safe. All of this month's drives support this, and many allow your external backup to be cloud-based. However, enough online storage to back up a multi-terabyte NAS device won't come cheap. Amazon S3 storage, as supported by a number of this month's devices, which costs around \$40 per terabyte per month.

Of course, the surest way to keep your NAS data out of the hands of virtual assailants is not to make it accessible via the internet in the first place. However, that would be missing out on some of the huge potential of these incredibly useful devices. The ability to access all the files on all your devices from any location is hugely empowering. If you take good care of the security settings of your NAS device, and ensure everything on it has a secondary backup elsewhere, you can enjoy the benefits of using a NAS as an online repository with very little risk.

# View from the Labs

SHOULD YOU BE CONSIDERING AN ONLINE CLOUD OPTION INSTEAD OF A NAS DEVICE ON YOUR LOCAL NETWORK? **JAMES MORRIS** ASKS: WHY NOT HAVE BOTH?

The NAS drive may seem like an anachronism, now that everyone is talking about the cloud. Why bother when you can simply put all your files online, access them from anywhere, and not have to worry about managing another piece of power-hungry hardware? Indeed, NAS manufacturers have been feeling this pressure, and some have combated it by marketing their devices as a form of cloud storage.

A NAS drive does lack some of the important features of true cloud storage. Sure, you can make your data accessible from anywhere, but this isn't virtualised storage – it won't be backed up in a redundant way that means there's only a very small chance of data being lost. Cloud storage is about outsourcing responsibility, not just making data available over the internet.

On the other hand, online cloud storage is expensive. The monthly cost of replicating the terabytes available on a NAS drive will soon mount up and exceed the cost of the standalone hardware.

That means there's room for both a NAS box and a cloud service in your storage strategy. A NAS drive full of multi-terabyte SATA hard disks is still the cheapest way to add storage to your network, and it can be made externally accessible in a similar fashion to the cloud. But having a cloud-based backup strategy for your most important documents can give you a valuable extra level of security and resilience. Should your NAS device fail, be stolen or destroyed in a fire – or even hacked – then you can carry on working from cloud versions of your files while you sort out the issue. It's also worth having a secondary local backup of files that may be too large for the cloud, such as a media collection. All the NAS drives here let you attach an external drive; we heartily recommend taking advantage of this by periodically making a backup of your NAS drive to a dumb device such as an external USB hard disk, which you store somewhere safe.

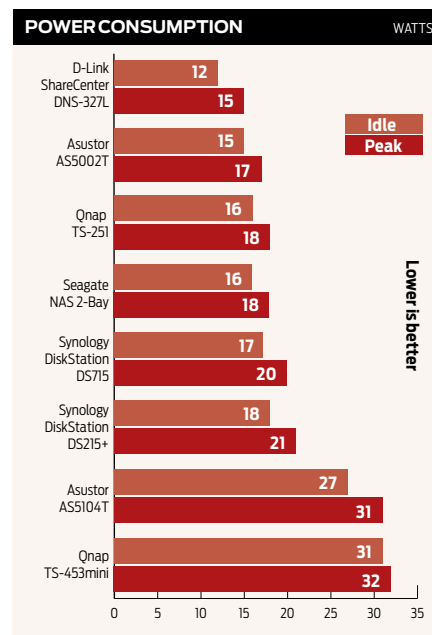
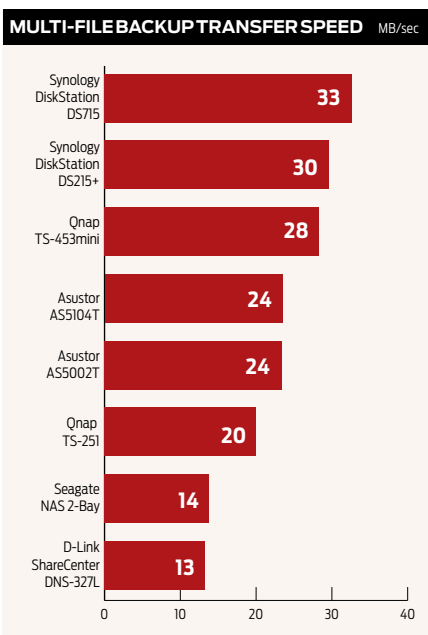
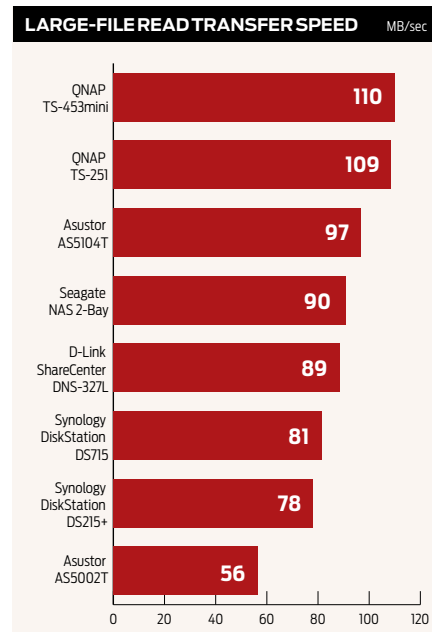
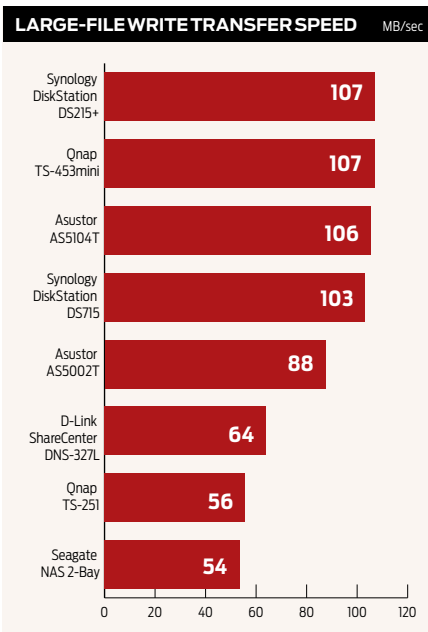
An interesting new possibility is BitTorrent Sync ([getsync.com](http://getsync.com)), which underlines the fact that BitTorrent is a general-purpose technology rather than one specifically designed for piracy. There's a free version with a ten-folder limit, and a Pro version for around \$60 per year. BitTorrent peer-to-peer technology is used to transfer only file changes,

greatly reducing network traffic, and cutting out the necessity of a fully online cloud service. It's also directly supported via installable apps by a number of NAS manufacturers.

Although the cloud is still a buzzword, in reality there are plenty of reasons to

stick with a NAS drive. It's much faster to access from the local network, and it will be cheaper per gigabyte for some time to come. With a secondary cloud or peer-to-peer system to back up your important files, you really can get the best of both worlds.

## Test results



# steelseries

## APEX M800

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# The power of a new platform

## Intel unleash Skylake



It's an exciting time to be a PC owner. Not only do we have a brand new Operating System in the form of Windows 10 to play with - and it's free, no less! - Intel has released the latest in its line of popular Core processors. The 6th Generation Core Processor, once known by its codename of Skylake, offers better performance, longer battery life and a range of features tailored to deliver a more instant, accessible experience for desktop and mobile users alike. With such a major new CPU release comes a new range of motherboard chipsets to complete the platform.

At the upper end of the performance spectrum is Intel's Z170 chipset, and it's aimed at those who want the very best in performance. Whether it's powering the ultimate gaming machine, whipping up 3D graphics and HD video edits in a high-end workstation, or simply delivering the fastest overall desktop possible, motherboards based on the Z170 chipset are just what you need. Let's take a look at what makes these Z170 motherboards so special.

### MORE SPEED FOR MORE DEVICES

Every device that you plug into your PC needs to communicate with the CPU via the motherboard, and it does so via little data highways called PCI Express or PCIe lanes for short. Z170 massively increases this compared to its predecessor, the Z97 chipset, allowing for more devices to run at faster speeds. Peripheral devices such as SSDs, sound cards, and dec video capture cards are spoilt for the Z170. Where the Z97 only offered eight PCIe lanes of the slower 2.0 variety, Z170 smashes this speed limit with a whopping potential of 20 lanes of the faster 3.0 version. This means you can run components without having to worry about slowing down performance of other components, as well as being able to install more demanding peripherals into your motherboard's external inputs.

### MEMORY REMASTERED

Z170 is the first mainstream motherboard chipset to support the latest DDR4

memory technology. Until now this super-fast memory type has been limited to extremely high-end chipsets aimed at professional workstations and extreme gamers, but DDR4 is now ready for everybody. Its faster speed means files will open and save quicker than ever, while loading new applications will be lightning fast. Mobile users will love its energy-saving properties, helping to conserve battery life. Meanwhile tweakers will relish the ability to crank DDR4 into the stratosphere, with speed settings of over 3GHz possible with high-end kits. However, if you'd rather stick with your existing DDR3 memory kit, certain Z170 boards will offer support for this older DDR3L memory type, helping to keep your upgrade cost to a minimum.

### PLUG IT IN, ALL OF IT.

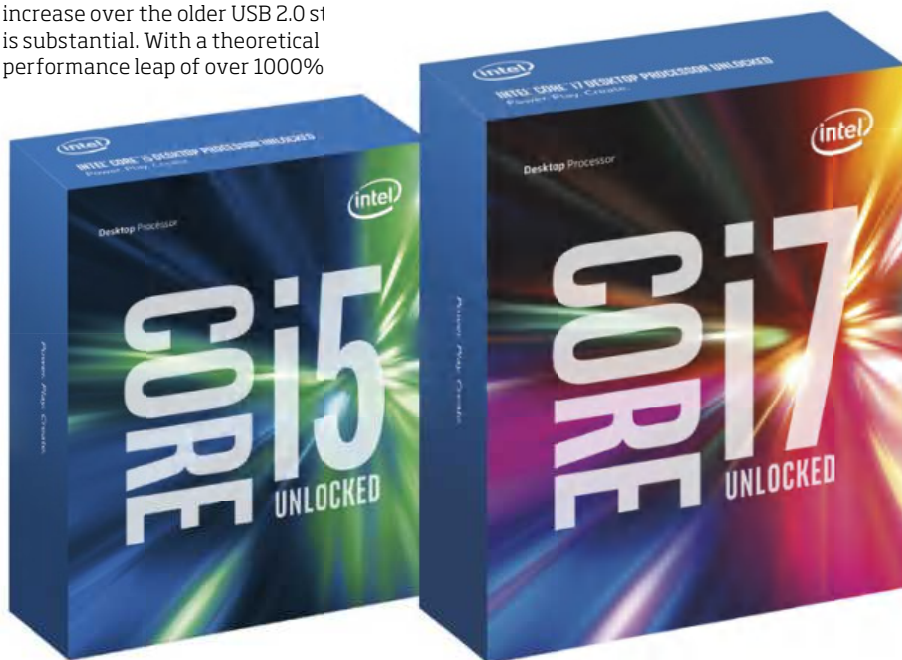
Z170 motherboards can support up to ten USB 3.0 ports, although you will see varying numbers based on how different motherboard manufacturers choose to implement this, so be sure to examine several boards as you make your purchasing decision. The speed increase over the older USB 2.0 standard is substantial. With a theoretical performance leap of over 1000%

compared to USB 2.0, USB 3.0 makes backing up your files to compatible USB 3.0 equipped external hard drives faster than ever before.

### UNLEASH YOUR INNER TWEAKER

If you're looking to squeeze every last ounce of performance out of the new 6th Generation K-series processors, Z170-based motherboards are for you. It's the only official platform to support overclocking of the K-series CPUs, and brings support for even finer tweaking options. Specifically, support for BCLK overclocking means tweakers can now increase the speed in much smaller leaps than the past, in both the CPU and integrated Graphics Processor found in the 6th Gen Core CPUs.

When combined with the impressive performance boost inherent in the 6th Generation Core CPU, motherboards based on the Z170 chipset deliver a new level of performance. No longer will you have to wait hours while backing up data to external hard drives, or worry about how many devices you can plug into your PC. With Z170 you've got the power to do it all.





# GIGABYTE LAUNCHES NEW 100 SERIES MOTHERBOARDS

*Trust GIGABYTE to give you the benefits of a Z170 motherboard to perfectly suit your needs*

The 100-series chipset, along with the new i5 6600K and i7 6700K CPUs marks a new era for the desktop PC with the continued support of DDR4, introduction of USB 3.1 over the new Type-C connector, as well as an array of onboard features and technologies that lets you unleash the full power of your PC.

"We are very excited to launch our new 100 series motherboards based on Intel's new Z170 chipset here at Gamescom in Germany," commented Henry Kao, Vice President of GIGABYTE Motherboard Business Unit. "We know everyone has been eagerly waiting for this, so we made sure our 100 series motherboards are packed with features which will make them stand out and provide the best possible experience from the latest 6th Gen. Core CPU from Intel."

With the 100 series, GIGABYTE offers three motherboard segments to satisfy everyone's specific needs. The Ultra Durable caters to users looking for a board that has long lasting, high quality components while the G1 Gaming targets gamers that demand cutting edge audio and graphics performance, and with the SOC Force

GIGABYTE is bringing a solution for those who are looking to push their hardware performance off the charts. GIGABYTE brings a series of features that won't let anyone down.

## INTEL 6TH GEN. CORE CPUS AND Z170 CHIPSET

With its new 6th Gen. Core CPUs and Z170 chipset, Intel provides notable improvements over the previous generation and revolutionary new features such as support for Windows 10 and DirectX 12, the latest and greatest operating system and API from Microsoft which are both supported natively on GIGABYTE motherboards. Additionally, the new LGA 1151 socketed 14nm CPU from Intel brings both DDR4 and DDR3 support as well as enough power to support up to 3 independent digital displays and enhanced full range BCLK overclocking!

## WORLD'S FIRST USB 3.1 WITH INTEL CONTROLLER

The Intel USB 3.1 controller, the industry's fastest USB controller, utilizes 4 PCIe Gen.3

lanes to offer a total bandwidth of 32 Gb/s, for uncompromised transfer speed of up to 10 Gb/s. With twice the bandwidth compared to its previous generation and backwards compatibility with USB 2.0 as well as 3.0, selected 100 series boards provide dual connectivity via USB Standard-A and the innovative USB Type-C making GIGABYTE the best USB 3.1 solution on the market with better compatibility over a wider range of devices.

## CREATIVE SOUND BLASTER ZXRI 120+DB SNR AUDIO CERTIFIED

GIGABYTE's Z170-Gaming G1 motherboards feature a quad-core Creative Sound Core3D audio processor with Burr-Brown High-End 127dB DAC. The discrete card level audio design featured onboard is certified for headphone jack output exceeding 120dB+ SNR lifelike sound.

## HIGH END NICHICON FINE GOLD AND WIMA AUDIO CAPS

With the Z170X-Gaming G1 motherboard, GIGABYTE introduces a combination of Hi-Fi grade WIMA Capacitors, and Nichicon audio grade Fine Gold capacitors. The Nichicon Fine Gold capacitors and WIMA FKP2 capacitors are used widely in premium-grade Hi-Fi systems.

## KILLER DOUBLESLOT-X3 PRO

GIGABYTE'S Killer network solution is featured on selected GIGABYTE Z170 high-end motherboards. Combining the Dual Gigabit LAN Killer E2400 with the Killer 1535 Wi-Fi card offering the latest 802.11ac+Bluetooth 4.1, the Killer DoubleShot-X3 Pro application can prioritize and redirect the most important traffic over the fastest connection available, making sure that your game is never affected by a congested network due to multitasking.

## ULTRA DURABLE PCIe METAL SHIELD

Seen first on its 100 series motherboards, GIGABYTE presents a new innovation in its Ultra Durable technologies lineup with the PCIe One Piece Metal Shield. Add-in cards can be extremely heavy, especially long graphics cards, and removing them can put a lot of stress on the connector.

See more at [www.gigabyte.com](http://www.gigabyte.com)

# GIGABYTE™



# Logitech G920 Driving Force Racing Wheel

LOGITECH'S LONG-AWAITED RETURN TO THE RACING WHEEL MARKET

Logitech's announcement that it was leaving the gaming peripheral market two years ago shocked many gamers. Racing game fans in particular were some of the hardest hit by this news. Would Logitech develop new racing wheels like the G27, which established the company as a cost-effective, reliable brand for racing wheels, ever again?

It seems as if the answer is a resounding yes, as Logitech has released two new wheels under its "G" gaming brand. One of these wheels is the G920 Driving Force, designed for the Xbox One with additional support for PC via the Logitech Gaming Software application. This marks the first time Logitech has created a wheel for Microsoft's gaming platform.

From the outside, the G920 continues the hallmarks of the G27 design, including the hand-stitched leather finish and stainless steel paddle shifters and pedals. The only major visual difference is the addition of Xbox buttons on the wheel face, making Xbox One menu navigation easy.

Internally, the G920 adopts a similar gear-driven, dual motor force feedback system from Logitech's older wheels. Because of this, thinking that the G920 and the equivalent G29 for the PlayStation 4 is just a G27 with added support for the new consoles is an easy

conclusion to make. This is made even more obvious when you consider that the G920's immediate competition, the Thrustmaster T300 and TX, have both adopted smooth belt-drives which are significantly quieter than gear-driven systems.

However, this is not entirely true. The G920 has undergone slight, but important, changes based G27 owner feedback. Long lasting hall-effect sensors have replaced the optical sensors from the G27, meaning the G920 is likely not to suffer a loss of precision that occurred on many previous Logitech wheels years after purchase.

The G920 is also significantly less noisy than that the G27, with the distinctive clanking noise that caused minor earthquakes in the homes of many G27 owners now being significantly reduced in occurrence and volume.

A major change for the G920 is the significant reduction of the force feedback deadzone, which meant that G27 owners missed out on upwards of the first 20% of the forces provided by games. This was especially noticeable on straights where nuanced effects are common. The G920 shows no obvious signs of this issue, with the deadzone now virtually impossible to notice.

The pedals have also undergone changes, with the brake pedal being the most obvious of them. The new brake

pedal is much heavier than before, and features non-linear progression designed to measure the force applied to the pedal instead of the pedal travel. This creates a similar feeling to the brakes on actual cars, and improves consistency under braking while reducing brake lock-ups. This change, combined with the inclusion of a dedicated clutch pedal, make the plastic, mushy two pedal set of the T300 and TX feel poor by comparison.

One negative of the G920 package is the removal of the six-speed stick shifter that was included with the G27, with the new Driving Force shifter being an optional \$80 purchase. This move was likely influenced by Thrustmaster's choice to make H-shifters a separate purchase for all its wheels, driving down initial costs. For those considering upgrading from a G27, the old G27 shifter is compatible with both the G920 and G29 though.

Sadly, game support on PC at the time of writing is lacking. While Xbox One support is spot on for all games that support force-feedback wheels, only very few games are currently working with the G920 on PC. Out of the many games tested, only F1 2015 and Euro Truck Simulator 2 work perfectly, with others suffering from force feedback issues. Hopefully these can be ironed out before the retail release of the G920 in October.

For new wheel buyers, the G920 provides the best overall wheel package in the sub-\$500 price range. The G27 can be found for much cheaper, but the inclusion of an H shifter can't offset the improvements to the wheel and pedals on the G920. The T300 is the better wheel of the two, but the Thrustmaster's poor pedals make it hard to recommend if you can't afford an extra purchase for better pedals.

For those seeking an upgrade from a G27, the decision is much tougher. The higher than optimal price point for the G920 hurts the case for upgrading, especially when you consider that the fantastic Thrustmaster T500 can be found for only a few hundred dollars extra.

**Justin Talent**

## KEY SPECS

\$499 • [www.logitech.com/en-au](http://www.logitech.com/en-au)

## OVERALL



**GIGABYTE™**

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**STAR CRAFT II**  
WORLD CHAMPIONSHIP SERIES



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TECH  
OF THE YEAR  
BEST MOTHERBOARD

**Intel**  
inside  
CORE

**Intel**  
inside  
CHIPSET 297



# VERSUS

TWO NEW GAMING KEYBOARDS PUT TO THE TEST

## LOGITECH G310 ATLAS DAWN \$219

### FUNCTION

- The custom (ie. non-Cherry) Romer-G switches have a spongy feel not unlike that found on a membrane keyboard. The closest Cherry equivalent would be Brown.
- There's a lot of lateral wobble.
- There are no gaming macro keys on this gaming keyboard, or software support for gaming macros.
- There is no USB header.

### DESIGN

- The thin and light plastic feels budget-grade and sets a low expectation. Pick it up with both hands and you can easily flex the entire unit.
- The edges of the concave bits on each key are sharply angled instead of curved like on other keyboards, giving the G310 a Klingonish vibe. They light up in blue.
- What appears to be a carry handle is on the left, but it's too thin for normal hands. What is it for? Is it so you can hang the G310 from your belt?
- The wrist rest protrusion on the left does not sit flush with your desk. Rest your wrist weight on it enough and it flips the whole keyboard up.
- A slide-out piece of plastic can hold your smartphone. There's an app.

### VALUE

There's no question Logitech has priced the G310 far above its actual worth as a device, and where it should be sitting in the market alongside competitor mechanical keyboards. We think the G310 should be no more than \$80.



## TT ESPORTS POSEIDON Z \$149

### FUNCTION

- It's available in a choice of Cherry Blue (loud and clicky) or Cherry Brown (soft, sweet, luxurious) switches.
- Fully programmable macro keys (shared, not dedicated) plus an on-the-fly macro recording button.
- A set of five pre-programmed (by you) profile buttons are shared in the page up/down area.
- There is no USB header.

### DESIGN

- The case is built from very rigid plastic which almost passes as metal at first glance. There are no stylistic adornments; instead it's clean attractive and elegant. There is minimal flex.
- All of the 16.8 million colours are included for backlighting, and can be mapped in virtually unlimited custom combinations.
- The serious look won't make you look or feel out of place doing serious work on your PC.

### VALUE

At \$149 the Poseidon Z is a good deal cheaper than the competing Corsair K90 RGB keyboard and with very similar features, although this one is plastic, the Corsair is metal.



## VERDICT

A monster kill for the Poseidon Z. This attractive, well designed board lays waste to the astonishingly overpriced Logitech G310 in value and features and design.

## Asus Strix 7.1

There's no denying that delivering true 7.1 surround sound through headphones is an impressive feat. The five neodymium magnets – two 40mm, one 30mm and two 20mm – housed in each ear cup deliver some serious noise, with genuine directionality when it comes to sound. Unfortunately those five drivers per ear also make the headset extremely bulky, weighing in at 350g sans cable, making for less than comfortable marathon gaming sessions. The ear cups are so big that even the biggest ears will fit in them but they can also press on the hinge of the jaw making them even less comfortable. Each ear cup also features an illumination that looks like the eye of a giant hungover and belligerent owl.

The most pleasing feature of the Strix 7.1 isn't the headset itself but rather the USB audio station. This box allows the user to control the volume of the various audio channels and mic as well as switch between four gamer-specific audio profiles tailored for FPS, Action/RPGs, Racing and footstep detection. The box can also be used as a pass through for regular speakers, adding precise control to a 5.1 or 7.1 speaker setup.

Unfortunately the audio centre utilises a proprietary connector so isn't compatible with any other headphones other than the massive Strix 7.1 headset. We think Asus would do very well selling this bit separately with universal compatibility.

**Daniel Wilks**



### KEY SPECS

\$249 • [www.asus.com.au](http://www.asus.com.au)

True 7.1 surround sound • USB audio station • Environmental noise cancelling

### OVERALL



**GIGABYTE™**



**GIGABYTE BRIX™**  
The Perfect Fit for Your Living Room





# We Happy Few

1984, BRAVE NEW WORLD AND THATCHERITE BRITAIN MEET IN A SURREAL SURVIVAL EXPERIENCE.

You wake up in a dilapidated underground bunker. There is a bunk bed, some broken furniture, a work bench and a ladder leading to the surface. The radio blares out the voice of Uncle Jack, a popular figure, always ready to make the people of Wellington Wells laugh, and to remind them of how terrible the Downers are. You are a Downer, a person not addicted to the artificial chemical happiness that runs through the veins of the people of Wellington Wells. You search the broken furniture and the corners of the room, picking up some discarded red pills, a bandage and some charcoal. Climbing the ladder, you find yourself in the desolate remnants of a once quaint English hamlet. The buildings are in ruins and desperate people trudge back and forth, spewing mindless epithets learned from the radio. You get too close to another citizen of Wellington Wells. He notices you're acting strangely and you aren't mindlessly smiling and waving at all and sundry. He snaps and beats you to death. It's time to start

again. The city reloads, this time with a different layout, you wake up in a bunker. On the radio Uncle Jack makes cruel jokes about Downers. Can you escape from the mindless, terrifying rictus grin that is Wellington Wells this time?

The idea behind We Happy Few is disturbing and bonkers in equal measure. In the world of We Happy Few, history diverted in 1933, leading to the Germans successfully invading and occupying England. Much of the country has been reduced to rubble, as has much of the city of Wellington Wells. To cast out the occupying force, the people of Wellington Wells did "A Very Bad Thing", and to drown out their feeling of guilt and anguish they invented a synthetic happiness drug aptly named Joy. One of the strange side effects of the chemically cheered society, the people of Wellington Wells have been able to create some remarkably futuristic science. Of course, all the science in the world means very little when half of your population, the have nots sequestered outside the inner hub of authority and



prosperity are slowly starving and going insane. Hamlyn, the upper class centre of Wellington Wells is protected by bridges and security checkpoints designed specifically to stop Downers from getting in. So how does a Downer trying to escape the grinning hell of Wellington Wells get through these checkpoints?

That is but one of the problems facing players of We Happy Few, and it's a challenge that changes every time you play. Combining elements of Rogue-like, stealth and survival games, We Happy Few isn't quite like anything that has come before. There is no saving or restarting – if you die you start again and a new version of Wellington Wells is procedurally designed. Stealth is a key component when it comes to escaping from the city, but it's stealth by subterfuge and social manipulation rather than by sneaking and hiding. As a matter of fact, trying to sneak anywhere is dangerous as it shows you are going against the status quo, singling you out as a Downer and dissident. Survival means eating food and drinking water, but also having to purify it if you don't want to be dosed up on the Joy that has been helpfully added to comestibles in Hamlyn you need to fake being on drugs to stay alive, stay off drugs to remain rational and escape, but sometimes indulge in Joy to make it through certain situations. You have to break the law to get the tools and materials you need to craft the gear you need to escape, but appear to obey the laws so you can get out unharmed.

There's always frustration to be had with having to constantly restart a game, but from what we've played so far, this cycle of death and trying again adds to the impact of We Happy Few. Death is a learning experience, not exactly in what to do, but rather what not to do. We Happy Few will be available around June 2016.

**Daniel Wilks**



## KEY SPECS

[www.compulsiongames.com/en/10/we-happy-few](http://www.compulsiongames.com/en/10/we-happy-few)

Genre - Survival • Developer - Compulsion Games •

Publisher - Compulsion Games • Platform - PC, XBone

**GIGABYTE**



# LASTING QUALITY

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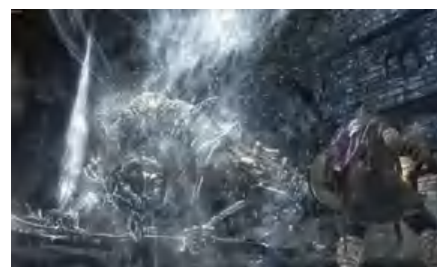
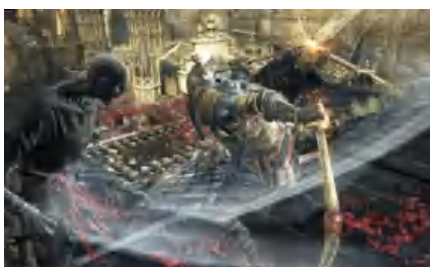


# Dark Souls III

PUNISHMENT GLUTTONS, LINE UP HERE PLEASE

Dark Souls II was a great game, one of the best of 2014 without a doubt, but it was missing something. That something was Game Director and president of FromSoftware Hidetaka Miyazaki. Miyazaki is the mind behind the Souls franchise, being responsible for both Demon's Souls and the original Dark Souls. Miyazaki only served as a supervisor on Dark Souls 2, as his time was being monopolised by Bloodborne, a fast paced PS4 exclusive Souls style game. His absence was telling. Rather than the sprawling levels of Demon's Souls and Dark Souls that required players to learn their way around, discover how different areas connected with each other and how to open secret passages and shortcuts to cut down or travel time, Dark Souls II instead featured a far more linear design as well as a mechanic that allowed the player to teleport between any unlocked bonfire. In essence, Dark Souls II was far more accessible to new players but didn't have as satisfying balance between difficulty, challenge and reward as the original game.

The fact that Hidetaka Miyazaki is in charge of Dark Souls III both in terms of structure and level design is obvious from the first moment of the hands on demo we recently had a chance to play, as was some of what he learned directing Bloodborne. There's a high gothic style to the buildings reminiscent of Bloodborne, and the overall pace of both movement and combat is a little faster than previous Souls games, something we were definitely grateful for not too soon after we started and undead swarmed from nearby buildings. As with previous Souls games, running away definitely seems like



it's going to be a very valid tactic in Dark Souls III and the slightly increased move speed makes that all the more vital.

The code we had a chance to play only featured two characters, the heavily armoured Wandering Knight and the burly Northern Warrior, the only real difference between the two in the demo being that the Knight was equipped with a kite shield and broadsword and the Warrior an axe and round shield. The choice of weapon proved to be important, as the major new mechanic in Dark Souls III is the Weapon Art. All weapons can be wielded normally, with heavy and standard attacks, jump attacks and the like, but with the press of a button the characters enters a special weapon specific stance capable of performing more specialised or devastating attacks. The broadsword, for example, has a charge and upward slash special attack from the Weapon Art that can break through an opponent's block. The axe can be used to trigger a battle-cry that briefly stuns an enemy followed by a few moments of berserker rage conferring extra damage. A giant greatsword and pair of fast sabres were also available in the demo, the former allowing players to smash enemies into the ground or juggle them into the air and the latter having a spinning area attacks that hits all nearby

enemies. To prevent these Weapon Art specific skills from being abused each character has a limited pool of points that fuel the abilities that can only be refreshed at the bonfires scattered around the game world.

The demo also hinted at the larger story at play in Dark Souls III but didn't let slip too many specifics. The "Lord of Cinder" will be the main threat of the game and it appears though fire and ash will be the overriding theme, from the burnt remains of bodies littering the streets to charred dragons, and the final boss encounter of the code, a giant but extremely slight monstrosity with all too fluid a gait, more joints than necessary and a veil. While entirely new to the series, the Dancer of the Forbidden Valley with her swords of oil and fire felt like a vintage Souls encounter. It was tough, sometimes frustrating and almost painfully difficult at times, but fighting with timing and caution eventually brought her down and brought back that feeling of incredible achievement synonymous with the Souls games.

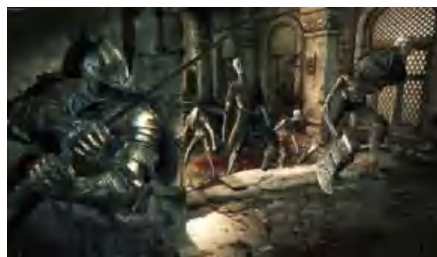
**Daniel Wilks**

## KEY SPECS

[www.darksouls3.com](http://www.darksouls3.com)

Genre - Action RPG • Developer - FromSoftware •

Publisher - Bandai Namco Games • Platform - PC, Xbone, PS4



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# The A-List

ONLY THE BEST OF THE BEST MAKE IT TO PC & TECH AUTHORITY'S A-LIST

The ongoing quest for betterment, here, is driven purely by a meritocratic thrust forward. We won't ever plop something in A-List just because it's the latest model.

That said! In enormous news for the A-List, we are updating the Amazon Kindle ebook reader. This seemingly forgotten corner of the page has held steady for an awfully long time. But before you completely lose control of your excitement centre, take note of reviewer Jonathan Bray's concluding comment, below, in which it seems the last one is still good, but the new one is nicer.

## WHAT WE SAID:

*The big limitation of the Kindle platform is the fact you can't read titles purchased from other ebook stores on Amazon ebook readers (it's possible, but not legal). The Kobo readers are a better bet if this is important to you.*

*For most people, however, a Kindle is the ebook reader to own. And when it comes to choosing a model, it's between the new Kindle Paperwhite and the Kindle Voyage.*

*The former offers a similar reading experience at a lower price; but the latter goes the extra mile, with a more attractive design, lower weight, swanky page-turn buttons and better contrast. The bottom line: both are brilliant reading devices. Just buy the one that best suits your budget.*

Jonathan Bray



## PC DESKTOP

ALL-IN-ONE  
Apple iMac 27in

★★★★★

PRICE \$2,199

SUPPLIER [www.apple.com/au](http://www.apple.com/au)

If you can afford it, the 27in iMac is the finest piece of all-in-one engineering on the market. A truly powerful beast with performance to match its looks.

**SPECIFICATIONS** 3.2GHz quad-core Intel Core i5; 8GB DDR3 RAM; 1TB Western Digital Caviar Black HDD; NVIDIA GeForce GT 750M 1GB; 27in 2560 x 1440 LCD.



## PERIPHERALS

WIRELESS ROUTER Netgear  
Nighthawk X6 AC3200

★★★★★

SUPPLIER [www.netgear.com.au](http://www.netgear.com.au)

Designed to keep pace with high-bandwidth content consumption, it is the router King.

**SPECIFICATIONS** 1GHz dual core processor with 3 offload processors, 6 High performance antennas, one 2.4GHz band and two 5GHz Wi-Fi bands

DESKTOP STORAGE CalDigit T3  
with Thunderbolt 2

★★★★★

SUPPLIER [www.amazon.com](http://www.amazon.com)

The T3 is an expensive RAID device, but when you factor in the drives and the capacity included, it's good value.

**SPECIFICATIONS** 6/9/12/15TB external hard disk with RAID; Thunderbolt and Thunderbolt 2, 135 x 241 x 116mm 4.5kg.



NAS Synology  
Diskstation DS415play

★★★★★

SUPPLIER [www.synology.com](http://www.synology.com)

For most home users, the DS415play is very impressive. It's an all in one box that can literally do it all.

**SPECIFICATIONS** 24x SATA 3.25"/3.5" drive bays - Intel Atom Dual Core 1.6GHz CPU - 1GB DDR3 RAM - 2x USB 3.0 & 3x USB 2.0 - 1x Gigabit Ethernet

ALL-IN-ONE PRINTER  
Canon Pixma IP 8760

★★★★★

SUPPLIER [www.canon.com.au](http://www.canon.com.au)

This Canon can do it all, and at a reasonable price.

**SPECIFICATIONS** 9600 x 2400dpi print; 2400 x 4800ppi scan; USB 2; 802.11n WLAN; 150-sheet tray

LASER PRINTER Dell B1160w

★★★★★

SUPPLIER [www.dell.com.au](http://www.dell.com.au)

The best all-rounder in our printer group test, with excellent text printing and decent costs.

**SPECIFICATIONS** 1800 x 600dpi resolution; USB 2; Wi-Fi; 150-sheet input trays; 331 x 215 x 178

# LAPTOPS



## VALUE Asus TF103C

★★★★★

**PRICE** \$429**SUPPLIER** [www.asus.com.au](http://www.asus.com.au)

While ostensibly a tablet with a removable keyboard, it also fits tidily into the value portable category thanks to its immense usability and remarkably low price.

**SPECIFICATIONS** Quad-core 1.86GHz Intel Atom Z3745 • 1GB RAM • 8GB/16GB eMMC storage • 10.1in 1,280 x 800 IPS display • dual-band 802.11n Wi-Fi



## PERFORMANCE Aorus X7

★★★★★

**PRICE** \$2,999**SUPPLIER** [www.aorus.com](http://www.aorus.com)

Super-sleek, light, outrageously powerful and with a spec-list that outclasses many high end desktop systems.

**SPECIFICATIONS** Q4-3.4GHz i7-4700HQ • 4GB/8GB DDR3L 1600, 4 slots (Max 32GB) • 17.3" Full HD 1920x1080 • NVIDIA® GTX 765M SLI GDDR5 4GB • mSATA 128GB/256GB, 2slot 2.5" HDD 500GB/750GB/1TB 5400rpm



## PROFESSIONAL Apple Macbook Pro Retina

★★★★★

**PRICE** \$2,499**SUPPLIER** [www.apple.com/au](http://www.apple.com/au)

We've selected the 2.9GHz i5 model with 8GB of RAM and a 512GB SSD. Doubling the RAM adds another \$280. Some may find, though, the 13in screen size to be limiting.

**SPECIFICATIONS** 2.9GHz Intel Core i5; 8GB RAM; 512GB SSD; 13in 2560 x 1600 LCD; 2 x USB 3; 2 x Thunderbolt 2; dual-band 802.11ac abgn Wi-Fi



## ULTRA PORTABLE Microsoft Surface Pro 3

★★★★★

**PRICE** \$1,549**SUPPLIER** [www.microsoft.com.au](http://www.microsoft.com.au)

Attach the Type Cover 2 and it's as good, if not better, than any 'proper' ultra portable laptop. It took three versions, but Microsoft has nailed this format. At least an i5 is recommended.

**SPECIFICATIONS** 1.9GHz Intel Core i5-4300U; 12in touchscreen (2160 x 1440); 8GB RAM; 256GB SSD; 802.11ac/abgn; Bluetooth 4

# HANDHELDS

## SMARTPHONE Samsung Galaxy S6

★★★★★

**PRICE** \$999**SUPPLIER** [www.sony.com.au](http://www.sony.com.au)

If only the best will do, look no further: the Samsung Galaxy S6 is the best smartphone on the market.

**SPECIFICATIONS** 2.5GHz Qualcomm Snapdragon Octa-core 2.1GHz/1.5GHz ARM Exynos 7420 SoC • ARM Mali-T760 GPU • 3GB RAM • 32/64/128GB storage • 5.1in 4K video • 2,550mAh battery • 1yr RTB warranty • 71 x 6.8 x 143mm (WDH) 1138g



## TABLET Apple iPad Air 2

★★★★★

**PRICE** \$539**SUPPLIER**[www.apple.com/au](http://www.apple.com/au)

The iPad Air 2 is definitively the best tablet on the market right now, and rightfully replaces its predecessor on our A-List.

**SPECIFICATIONS** 1.5GHz Apple A8X SoC • 2GB RAM • 16/64/128GB storage • 9.7in 1,536 x 2,048 IPS display • 7,340mAh battery



## EBOOK READER Kindle Paperwhite

★★★★★

**PRICE** \$199**SUPPLIER**[www.amazon.com](http://www.amazon.com)

The premium Kindle goes the mile, with a more attractive lower weight, swanky page-i buttons and better contrast.

**SPECIFICATIONS** 6in 1,072 x 1,448 E Ink Carta display • 2GB storage • single-band 802.11n Wi-Fi • optional 3G • 1yr RTB warranty • 117 x 9.1 x 169mm (WDH)

NEW



# SOFTWARE

## SECURITY Norton Security 2015

★★★★★

**SUPPLIER** [www.norton.com/security](http://www.norton.com/security)

Great malware protection and equally good legitimate software recognition

## BACK UP Acronis True Image 2015

★★★★★

**SUPPLIER** [www.acronis.com.au](http://www.acronis.com.au)

The 2015 version adds full-system backup and dual backup and unlimited cloud storage.

## OFFICE SUITE Microsoft Office 365 Home Premium

★★★★★

**SUPPLIER** [www.microsoft.com.au](http://www.microsoft.com.au)

The easiest to use Office to date.

## WEB DEV Adobe Dreamweaver CS6

★★★★★

**SUPPLIER** [www.adobe.com.au](http://www.adobe.com.au)

This edition makes PHP and CMS its core focus.

## AUDIO Cubase 7.5

★★★★★

**SUPPLIER** [www.steinberg.net](http://www.steinberg.net)

The addition of better filters solidifies this program's continued place on the A-List.

## VIDEO Sony Vegas Movie Studio HD Platinum 11

★★★★★

**SUPPLIER** [www.sony.com.au](http://www.sony.com.au)

May not have the bells and whistles of other consumer editing packages, but its tools are efficient.

## PHOTO Adobe Photoshop Lightroom 6

★★★★★

**SUPPLIER** [www.adobe.com.au](http://www.adobe.com.au)

Lightroom 6 doesn't add up to a revolutionary update, but it improves on what was already an exceptional piece of software.



TOTAL: \$2955 RIG ONLY: \$2078

COOLER	 <p><b>COOLERMASTER NEPTON 140XL</b>  <b>PRICE</b> \$120  Easy to install AIO CPU cooling, relative quiet and performance to rival twin-radiator units.</p>	CASE	 <p><b>BITFENIX RONIN</b>  <b>PRICE</b> \$99  BitFenix continues to deliver great budget cases that look terrific and are easy to build in.</p>
SYSTEMDRIVES	<p><b>SAMSUNG 850 PRO 512GB</b>  <b>PRICE</b> \$449  Samsung's newest SSD offers greatly improved durability. Supplement it with a hard drive of your choice if needed.</p> 	KEYBOARD	<p><b>CORSAIR K70</b>  <b>PRICE</b> \$170  The glorious perfection of mechanical keys with thought-out gamer'd</p> 
DISPLAY	 <p><b>LG IPS277L</b>  <b>PRICE</b> \$499  27 inches of IPS glory. The resolution isn't perfect, but the price is. The thin bezel makes this a very attractive screen.</p>	MOUSE	 <p><b>RAPOO V900</b>  <b>PRICE</b> \$69  Accurate, good lift-off performance and decent ergonomics at a fairly amazing price.</p>
AUDIO	<p><b>HYPERX CLOUD II</b>  <b>PRICE</b> \$149  The HyperX Cloud II provide excellent sound quality and not just for the price range.</p>  <p><b>SOUND BLASTER X-FI XTREME</b>  <b>PRICE</b> \$80  The best positional game audio at this price and good music quality.</p>	POWER SUPPLY	<p><b>COOLER MASTER G750M</b>  <b>PRICE</b> \$125  Outstanding value for money, it's powerful enough for even performance PCs packing twin GPUs.</p> 

TOTAL: \$6457 RIG ONLY: \$5205

COOLER	 <p><b>CORSAIR H100i GTX WATER COOLER</b>  <b>PRICE</b> \$179  Excellent cooling that is easy to install with advanced monitoring.</p>	CASE	<p><b>NEW</b></p>  <p><b>ANTEC S10</b>  <b>PRICE</b> \$699  If you absolutely must have what is very nearly the best case we've seen, this is the one.</p>
SYSTEMDRIVES	<p><b>INTEL 750 1.2TB SSD</b>  <b>PRICE</b> \$149  This is easily the fastest consumer drive we have tested, and by a large margin.</p>  <p><b>SEAGATE BARRACUDA 2TB</b>  <b>PRICE</b> \$100  Supplement the PRO with cheap HDD storage.</p>	KEYBOARD	<p><b>CORSAIR VENGEANCE K95</b>  <b>PRICE</b> \$189  The perfect keyboard. Lovely Cherry Red mechanical switches, a slick and attractive aluminium body and customisable backlighting make this The One.</p> 
DISPLAY	 <p><b>PHILIPS BDM4065UC 4K 40"</b>  <b>PRICE</b> \$1033  It's huge, remarkable value and having one in front of you is PC paradise.</p>	MOUSE	 <p><b>CM STORM REAPER</b>  <b>PRICE</b> \$85  Very solid and feels fantastic under the hand with sweet on-screen movement.</p>
AUDIO	<p><b>CREATIVE SOUND BLASTER ZXR</b>  <b>PRICE</b> \$289  Superb music and general audio, with the versatility of a comprehensive set of connectivity options.</p> 	POWER SUPPLY	<p><b>CORSAIR HX1000i</b>  <b>PRICE</b> \$299  Corsair's mighty HX1000i pumps out extremely reliable power, even when under full loads.</p> 



TOTAL: \$2955 RIG ONLY: \$2078

## COOLER



## COOLERMASTER NEPTON 140XL

PRICE \$120

Easy to install AIO CPU cooling, relative quiet and performance to rival twin-radiator units.

## CASE



## BITFENIX RONIN

PRICE \$99

BitFenix continues to deliver great budget cases that look terrific and are easy to build in.

## SYSTEMDRIVES

## SAMSUNG 850 PRO 512GB

PRICE \$449

Samsung's newest SSD offers greatly improved durability. Supplement it with a hard drive of your choice if needed.



## KEYBOARD

## CORSAIR K70

PRICE \$170

The glorious perfection of mechanical keys with well thought-out gamer design.



## DISPLAY



## LG IPS277L

PRICE \$499

27 inches of IPS glory. The resolution isn't perfect, but the price is. The thin bezel makes this a very attractive screen.

## MOUSE



## RAPOOH V9000

PRICE \$69

Accurate, good lift-off performance and decent ergonomics at a fairly amazing price.

## AUDIO

## HYPERX CLOUD II

PRICE \$149

The HyperX Cloud II provide excellent sound quality and not just for the price range.



## SOUND BLASTER X-FI XTREME

PRICE \$80

The best positional game audio at this price and good music quality.

## POWER SUPPLY

## COOLER MASTER G750M

PRICE \$125

Outstanding value for money, it's powerful enough for even performance PCs packing twin GPUs.



TOTAL: \$6017 RIG ONLY: \$4765

## COOLER



## CORSAIR H100i GTX WATER COOLER

PRICE \$179

Excellent cooling that is easy to install with advanced monitoring.

## CASE



## ANTEC S10

PRICE \$699

If you absolutely must have what is very nearly the best case we've seen, this is the one.

## SYSTEMDRIVES

## INTEL 750

PRICE \$1499

This is easily the fastest consumer drive we have tested, and by a large margin.



## SEAGATE BARRACUDA 2TB

PRICE \$100

Supplement the PRO with cheap HDD storage.

## KEYBOARD

## CORSAIR VENGEANCE K95

PRICE \$189

The perfect keyboard. Lovely Cherry Red mechanical switches, a slick and attractive aluminium body and customisable backlighting make this The One.



## DISPLAY



## PHILIPS BDM4065UC 4K 40"

PRICE \$1033

It's huge, remarkable value and having one in front of you is PC paradise.

## MOUSE



## CM STORM REAPER

PRICE \$85

Very solid and feels fantastic under the hand with sweet on-screen movement.

## AUDIO

## CREATIVE SOUND BLASTER ZXR

PRICE \$289

Superb music and general audio, with the versatility of a comprehensive set of connectivity options.



## POWER SUPPLY

## CORSAIR HX1000i

PRICE \$299

Corsair's mighty HX1000i pumps out extremely reliable power, even when under full loads.



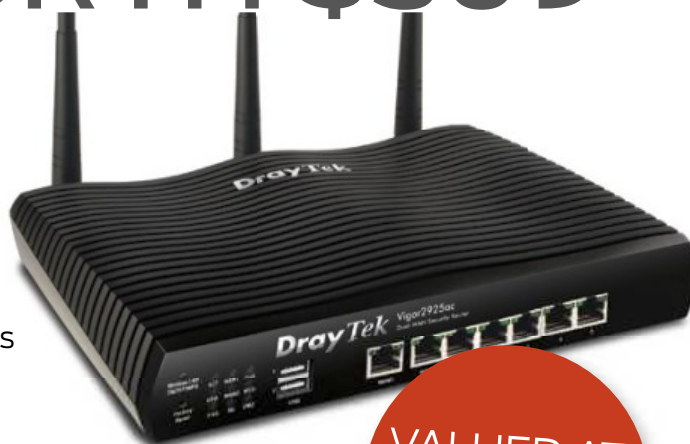
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Aust & NZ  
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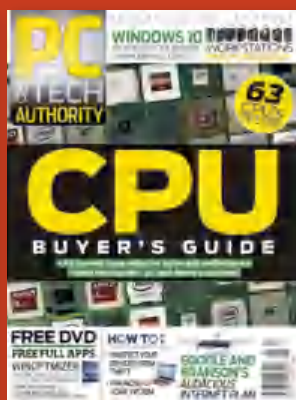
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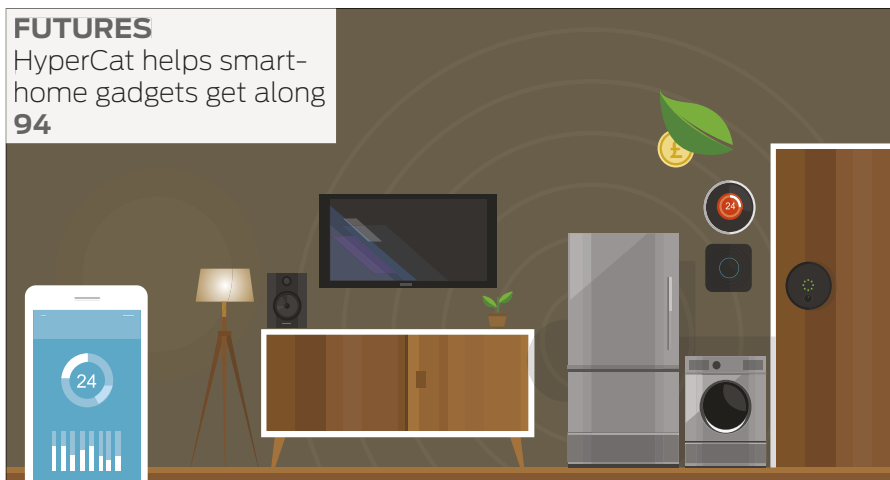


# THE BACK SECTION

Real world experience, the newest of the new in tech and some strong opinion

## FUTURES

HyperCat helps smart-home gadgets get along  
**94**



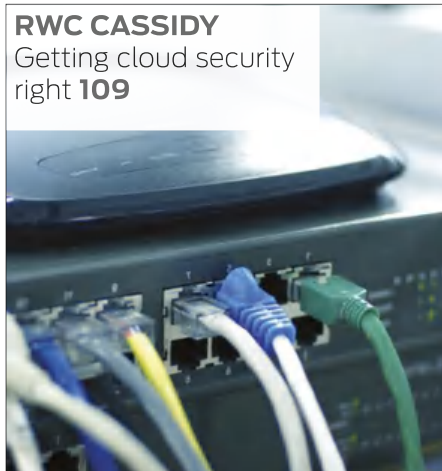
## HOW TO PHOTODIRECTOR

Organise, enhance and share your photos **90**



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Killer Robots!  
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## RWC OCKENDEN

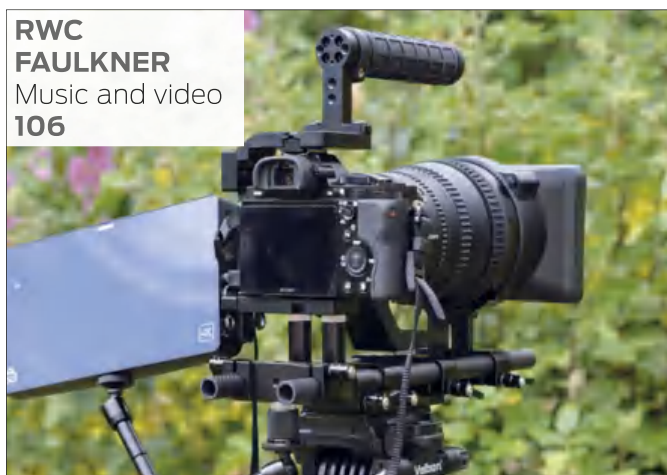
Awesome USB gadgets **103**



## FUTURES:

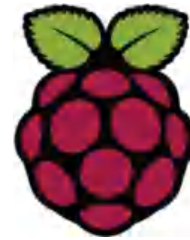
Sirius in-car display **97**

**RWC FAULKNER**  
Music and video  
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# HACKING MINECRAFT ON THE RASPBERRY PI



**Kevin Partner** shows how the Raspberry Pi version of Minecraft can excite the next generation of coders

I was inspired to learn to program by a bug. I was playing The Hobbit on my ZX Spectrum when the game crashed and the underlying BASIC code started streaming down the TV screen. Although I knew nothing about programming at the time, I recognised some words among the gobbledegook – and I realised that creating games wasn't an arcane art but an accessible, achievable, creative pursuit. Similar inspiration can be provided by the Raspberry Pi today.

The Raspberry Pi 2 is a surprisingly capable device, considering its sub-\$60 price. It comes with a version of Minecraft preinstalled, along with an API that lets you write code to be run in the virtual world. You do this in Python, which is simple to learn. The combination of the Pi, Python and Minecraft provides a great opportunity to start exploring the possibilities of programming. And the thrill of seeing a house build itself on a virtual landscape isn't just for kids, either.

## SCRIPTING IN MINECRAFT

Minecraft is an open sandbox game that doesn't have a plot line to follow. It's sometimes described as "virtual Lego", as the player can build any kind of structure using the blocks at their disposal. The version bundled with the Raspberry Pi has a limited feature set suited to its educational role – so you don't need to worry about being chased by zombies.

✓ Our script will build a house before your eyes

Interacting with this world requires no special setup, only a recent build of the Raspbian OS plus a programming environment. I'd opt for Geany, which you can install by opening up LXTerminal and typing:

```
sudo apt-get install geany
```

Let's start by creating a script for building a house in front of the player – but rather than just slapping one into place, we're going to animate it. We're also going to build in various configurable settings, which will allow the player to experiment with different dimensions and materials. This will also make the program modular, so it can be used as the basis for creating more sophisticated dwellings.

You can download the code from [tinyurl.com/p9zz76u](http://tinyurl.com/p9zz76u). To make it work, load it into Geany then start Minecraft and create a new world. Press the Tab key to release the cursor from the Minecraft window and click the cog icon in Geany (or press F5) to launch the script. You should see a house magically assemble itself. If you don't, try turning around – it might be behind you! You can see the script in action at [tinyurl.com/qysct6b](http://tinyurl.com/qysct6b).

So how does the script work? Well, first it opens a link to Minecraft:

```
import mcpi.minecraft as minecraft,
time mc=minecraft.Minecraft.create()
```

*"I've been programming professionally for more than 20 years and I still get a thrill when a snippet of code works as intended"*

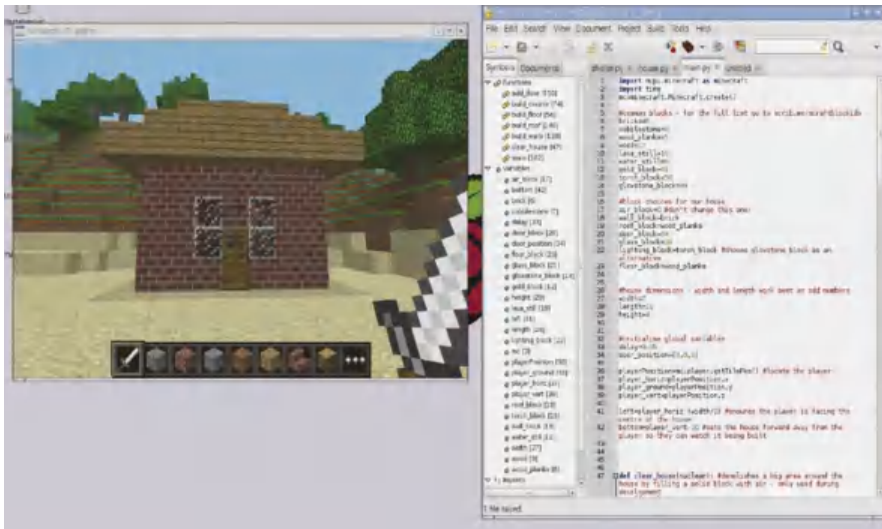
In Python, it's important to pay attention to indentation, since that's how code is divided into blocks. In this case, both lines are flush with the left-hand margin: the first line imports the Minecraft and Time libraries and the second creates a Minecraft object for us to use throughout.

The next 25 lines set a few variables for the blocks we're going to use so we can refer to them as, say, wood\_planks rather than by their block ID (5, in this case). We then indicate which of these blocks will be used for the walls, which for the roof and so on. We can easily change the construction of the house completely by swapping brick walls for cobblestone, for example. Finally, we set the width, length and height of our desired dwelling.

We now call the Minecraft function `mc.player.getTilePos()` to locate the player in the landscape, and the values that come back are then used to create two variables, left and bottom, to describe where the first corner of the dwelling will be.

Thereafter, the structure of the script matches the Minecraft process of "manually" building a house. We begin by clearing a space so that if the player chooses to build the house inside, say, a mountain, the living area won't be solid stone. Here's the block of code – the function in Python – that does this:

```
def clear_house(nuclear):
    if nuclear==True:
        blast_zone=20
    else:
        blast_zone=0
    mc.setBlocks(left-blast
zone,player_ground, bottom+blast
zone,left-width+blast_zone, player_
ground-height+blast_zone+10,bottom-
length-blast_zone,air_block)
```





When we call `clear_house`, we pass in the parameter `nuclear`. It has the value `True` or `False`. You can try calling it with `True` to clear a larger volume around the target area, or call it with `False` to confine clearance to the internal dimensions of the house.

In Minecraft, the `mc.setBlocks` function is used to create a cube of blocks by passing it the co-ordinates, in three dimensions, of opposite corners followed by the block type you wish to use. In this instance we're clearing a space, so we will use air.

Once we've cleared the space it's time to move on to construction. Each of these construction stages takes place in its own function. At the end of the script, you'll see a function called `main()`, which controls the program flow by calling each phase of construction in turn. By naming our functions sensibly and calling them from `main()`, it's easy to understand what the program is doing:

```
def main():
    clear_house(False)
    start_pos=[left,bottom,player_
ground]
    build_floor(start_pos)
    course=build_walls(start_pos)
    add_door(door_position)
    time.sleep(delay*10)
    build_roof(start_pos, course)
```

The next function called in `main()` builds the floor – this uses `mc.setBlocks` again to carve out a foundation (for artistic effect) and then add a cube of floor tiles with a depth of one block to create a solid floor in our house.

## BUILDING THE WALLS

The `build_walls` function is the heart of the program. The most efficient way to create the shell of a house would be to slap down a solid cube of bricks and then use `clear_house` to carve out the interior. However, we want the house to appear to construct itself, so we need to place blocks individually, one after the other. Here's a simplified version of the wall-building code:

```
def build_course(start_pos, direction,
course):
    blocks=1
    current_horiz=start_pos[0]
    current_vert=start_pos[1]

    if direction=="up" or
direction=="down":
        number_of_blocks=length
    else:
        number_of_blocks=width

    while blocks<number_of_blocks:
```

```
        mc.setBlock(current_
horiz,player_ground+course,current_
vert,wall_block)
    if direction=="up":
        current_vert-=1
    elif direction=="down":
        current_vert+=1
    elif direction=="right":
        current_horiz+=1
    else:
        current_horiz-=1
    blocks=blocks+1 # move onto the next
block
    time.sleep(delay)
```

We begin by storing the starting position – this will be the position of the last block laid from the previous course of blocks. We then specify how many blocks to lay, depending on whether we're going along the length of the building or its width.

The building phase is contained within the `while` block – this continues

*"We're going to build in configurable settings, which will allow the player to experiment with various dimensions and materials"*

to run until we have laid all the blocks. `mc.setBlock` places a single block at the co-ordinates shown, then increments one of those co-ordinates depending on the direction in which we're laying. The effect is that blocks are laid along a wall before turning a corner and continuing in a rectangle until the course is completed.

The final version of the code is a little more involved, adding windows to each wall. The windows are dynamically sized so that they're half the

length of the wall and centred. It also records the position for the door; it's added once the walls are built. Courses are controlled from the `build_walls` function, which repeats the `build_course` function for each course of blocks until it reaches the final height.

The last function in `main()` is `build_roof`. This uses `mc.setBlocks` to create a roof in layers of solid blocks. The number of layers is proportional to the size of the house.

## NEXT STEPS

Above, I've provided just an overview of the script. Although there's more to the process than I've described here, the code contains comments and should be easy to follow. You might begin by setting different house sizes: you could stand in front of a mountain, specify a length of 51 and a width of 31 and run the script to create a subterranean palace, for example. You could even try building your house in the ocean or in the air – do this by double-pressing the spacebar to fly, then press again to raise yourself before running the script. Alter the `wall_block` and `roof_block` variables to see what happens if you create the walls or roof out of gold or, indeed, lava. You can add your own blocks by consulting the full list at [tinyurl.com/o8w5zag](http://tinyurl.com/o8w5zag), and adding the associated variable to the script.

More challenging modifications might include adding multiple storeys to the structure if the height variable is set to a large enough value. Work out how to add turrets, for example, and you have the makings of a Minecraft castle.

These tweaks might sound trivial, but I've been programming professionally for more than 20 years and I still get a thrill when a snippet of code works as intended. If you've never programmed before, I hope you'll give it a go – and if you have a Minecraft fan in the household, I suggest letting them loose on the code and seeing where it takes them. ●

✓ Adopt the code to build castle turrets





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# GETTING TO KNOW PHOTODIRECTOR 5

Organise, enhance and share your photos with this powerful all-in-one tool - included with this month's PC&TA DVD

Taking photos is easy. You probably have a high-quality camera in your pocket right now, built into your smartphone. But when you come to share your snapshots, you may find they lack the brightness and vibrancy of professional images.

The secret is that pressing the shutter is only the start of the process. Just as old-fashioned photographers used to spend hours in the darkroom perfecting the exposure of their images, so today's professionals use software to make their images "pop". With CyberLink PhotoDirector 5 – included with the DVD included with this month's print edition of *PC & Tech Authority* – you can do the same with your own images, and make your holiday snaps the envy of your Facebook friends. Or, you can print out stunning scenes to decorate your home.

## THE PHOTOGRAPHIC WORKFLOW

The Home Edition of CyberLink PhotoDirector 5 includes all the functions of the Deluxe Edition, which means everything you need for touching up and enhancing your images is here. Some controls bring up a requester inviting you to upgrade to PhotoDirector 6 Ultra,

which adds features such as panorama stitching and photo-compositing. However, all the key features are here.

The workflow starts with importing and organising your images. PhotoDirector's Library module makes it easy to import photos from a folder or memory card, and organise them so you can cherry-pick the pictures you want to work on. Automatic tagging and facial recognition help you keep things in order as your library grows.

Then it's time to move onto PhotoDirector's adjustment tools. Here's where the real magic happens: simply tweaking the exposure and colour balance is often enough to bring an image to life. If you want to go further, there are plenty of other controls to play with too, including HDR effects, sharpening and noise reduction. Local adjustments let you tweak individual parts of the image to create the right overall balance, or draw the viewer's eye to the important element. You can also correct photographic issues such as barrel distortion or red-eye, and use content-aware technology to automatically remove unwanted intrusions from the scene.

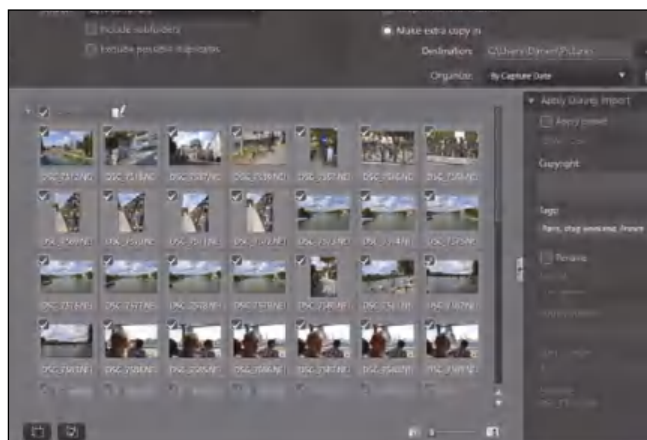
Finally, once you're happy with your picture, it's time to share it with the world.



PhotoDirector includes a dedicated module for creating and sharing online slideshows, as well as a print module that makes it easy to send images to your printer. If you want to send your photos to a professional printing service – perhaps to get large, glossy prints – that's easy too, with a comprehensive Export feature.

PhotoDirector 5 comes with a built-in help system, and if you hover over a button you'll see a pop-up tooltip telling you what it does. But the best way to learn is to get hands-on: edits you make in the program are non-destructive, so you can always roll back to your original image at any time. You've nothing to lose by diving in and finding out for yourself what PhotoDirector can do for your images.

## WALKTHROUGH How to import your images



1 Start by telling PhotoDirector where to find your images. Click the Import button at the bottom left of the window and choose whether to import individual files or folders, or to copy the images off a connected camera or SD card. Both JPEGs and raw files are supported.

Once you've chosen the source of your images, you'll see the import window, as above. At the top right of the window you can choose to leave selected images where they are (if you've already copied them onto your hard disk), or to copy them to a specified location. You can also apply a preset to all the images you're importing – see opposite – and add tags (such as the location) by simply typing them into the field on the right-hand side. Click Import at the bottom right to proceed.



2 Once you've imported your images, you'll see them displayed in a camera-roll view along the bottom of the window. Now you can take advantage of PhotoDirector's facial-recognition feature, so you can easily find photos containing specific people.

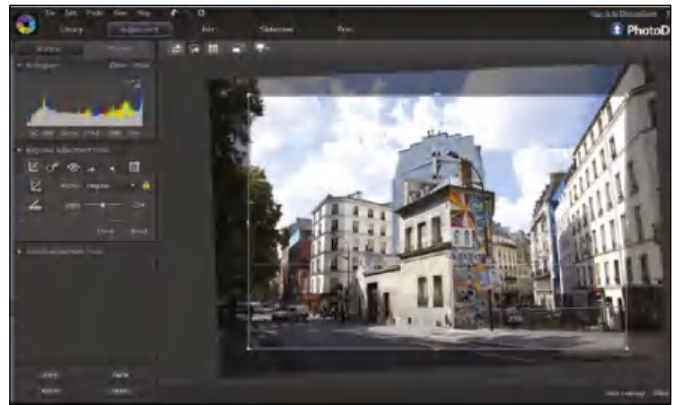
To do this, select the images you've just imported and click the Tag Faces button above the camera roll. PhotoDirector will spend a minute or two attempting to identify all the faces, and then you'll be invited to tag them with names (and tell PhotoDirector if two faces it's identified as different people are in fact the same). With this done, look in the Project pane at the left of the Library module: you'll now see a set of filters that you can click to show images containing certain people.



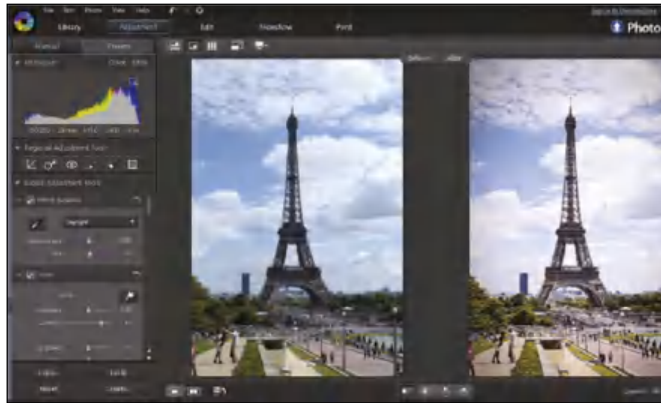
## WALKTHROUGH Adjustment tools



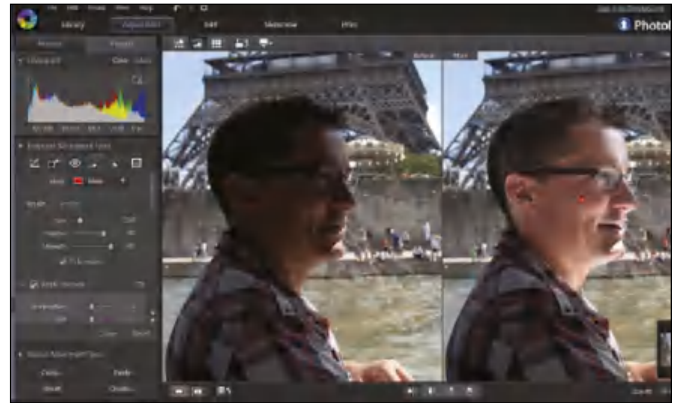
**1** Click on the Adjustment tab to start touching up an image. (To hide the camera roll, as shown, click the Viewer Only button above the top left of the image.) The basic adjustments live in the left-hand pane: under White Balance, click the dropdown menu and select Auto then, under Tone, click the magic-wand icon to automatically correct the exposure. You can fine-tune these values by dragging the sliders manually.



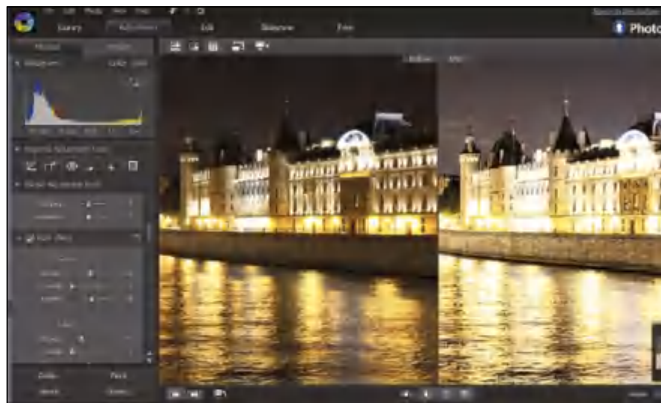
**2** Cropping an image can help emphasise your subject. Under Regional Adjustment tools, you'll find the Crop And Rotate function: click it, then drag with the mouse to mark the area you want to keep. You can change the shape of the crop area using the Aspect menu, and use the Angle tool to rotate the frame. Click Done when you're happy; if you change your mind, you can come back and adjust the crop area later.



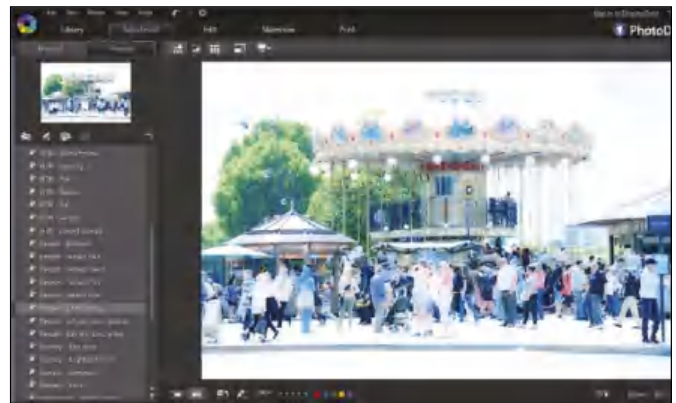
**3** At the bottom left of the image, you'll find the Before/After view option, which shows how your adjustments have affected the image's overall appearance. In this example, we've set White Balance to Auto, pulled up the Dark slider under the Tone controls to bring out detail from the shadows, and added a Vignetting Effect at the corners: you'll find this at the bottom of the adjustments pane, under Lens Correction.



**4** One of PhotoDirector's most powerful tools is the Adjustment Brush (it's the fourth tool from the left under Regional Adjustment Tools). This gives you a paintbrush-type tool that you can use to mark certain areas of your image, then adjust the White Balance and Tone only in those areas. It's the perfect way to rescue detail that would otherwise be lost in shadows, or spoilt by an unwanted colour cast.



**5** HDR – “high dynamic range” – is a photographic technique that brightens the dark areas of an image without overexposing the light regions. The effect has been described as “hyper-real”, but used tastefully it can add vibrancy to natural-looking scenes. To try it out, simply drag up the Glow sliders under HDR Effect. You can also experiment with the Edge sliders to subtly exaggerate the contrast of a scene.

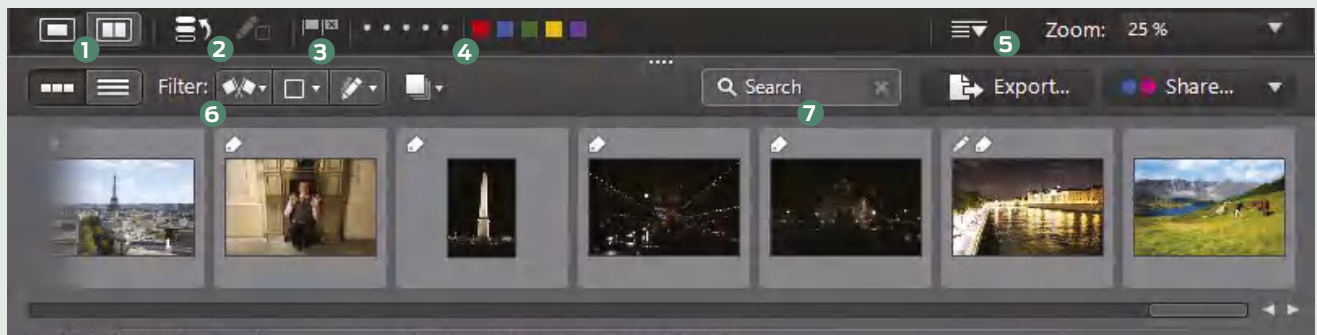


**6** The Presets tab at the top of the Adjustment pane contains a selection of settings that can give your images a distinctive look. These may not seem very useful, but you can also add your own presets, then easily apply them to multiple images: above the list, the second icon along lets you create a new Preset using your current adjustment settings. You can also download new Presets from CyberLinks's DirectorZone website.





## SELECTING AND VIEWING IMAGES



- 1 Once you start adjusting the tone and colour balance of an image, it's easy to accidentally go too far and end up with unnatural, garish results. The Before/After view offers a helpful reminder of what your original image looked like.
- 2 If you take a wrong turn while processing a photo, you can retrace your steps by clicking to open the History pane. Here you'll see a list of all the adjustments applied to the selected image, and you can click your way down the list to step back through its previous states. When you find a state you want to revert to, simply click Apply – or, if you're happy with the image the way it is, click Cancel. You can also click the Reset button at the bottom of the Manual Adjustment pane to abandon all the adjustments made to the selected image.
- 3 When you import a large number of images, you'll typically want to focus on just a handful of them. PhotoDirector lets you easily “flag” images that you want to work on – and flag ones that you're definitely not interested in with an “X”. These small icons can be fiddly to hit – you can quickly flag an image by hitting S on the keyboard (for “select”) or X to flag it as rejected.
- 4 If the flagging system doesn't provide enough granularity, you can also tag selected images with a star rating – hover over these dots and they will turn into a number of stars, from one to five, which you can click to apply the rating. You can apply colour-coding, too, as a more neutral way of grouping images together.
- 5 If you're feeling overwhelmed by the number of icons, you can disable the flag, rating and colour label controls here. You can also enable rotation controls, and previous/next buttons to help you step through your images.
- 6 Here's where you can filter the camera roll according to the flags, colours and ratings you've applied. If you've only flagged images to reject, you can choose to view only unflagged photos. The third icon (the one that looks like a pair of pencils) also lets you view only images that you've applied adjustments to – or ones you haven't.
- 7 Finally, the Search box lets you type in tags directly, and view all the images that have been tagged with a particular keyword or phrase. You can edit image tags in the Metadata pane within the Library module.

## WALKTHROUGH How to share your photos



1 When it comes to sharing your images online, you can click the “Share...” button to upload selected images directly to Facebook or Flickr. Or, if you prefer a multimedia presentation, you can turn a selection of images into an video slideshow: just switch to the Slideshow module and drag photos from the camera roll into the main view. You can apply transitions and text overlays using the pane on the left, and set how long each image should display for. Each image appears for the same duration, but one neat feature is the Fit To Music option: upload an MP3 or WMA file to play in the background, and PhotoDirector will set timings to match the length of the music. When you're finished, click Produce to generate a video file, or click “Share...” to upload it directly to YouTube.



2 For those who prefer to share their images in physical form, the Print module lets you arrange your images in a grid and send them directly to your printer. You can adjust the Cell Size to create space between your images – or configure a 1 x 1 grid to print out a single image as a full page.

If you prefer to get your images professionally printed, you can easily export high-resolution copies of your photos using the Export button, which you'll find towards the bottom right of the Library, Adjustment and Print modules. You can choose the format to export your image in, and optionally resize your images: we recommend using high-quality JPEGs at their original size, to retain as much quality and detail as possible. ●



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# HYPERCAT HELPS SMART-HOME GADGETS GET ALONG

The Internet of Things isn't very good at communicating - but one organisation wants to get devices talking

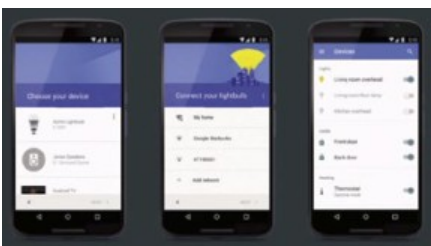


Current smart devices are very good at talking to the cloud and passing data to an app on your smartphone, but they don't rub along with one another. Instead, all that data is in silos, proving that the age-old IT problem of interoperability continues to afflict the latest technological innovations.

Internet of Things consortium HyperCat aims to fix that, letting data created or collected by an IoT device be discovered and shared by other systems, even if they don't happen to share the same platform or specification.

Most IoT devices follow the same model: they connect via a gateway to cloud services and finally onto some sort of application. So said

✓ A simple and consistent interface may help Brillo gain traction against the efforts of HyperCat.



Pilgrim Beart, founder of smart-devices firm AlertMe and co-chief of 1248, which helped found HyperCat. "Unfortunately everyone uses slightly different architectures, slightly different standards, and the result of this is that nothing works with anything else," said Beart, speaking at a conference.

"This is not the Internet of Things," Beart added. "For the Internet of Things to happen, we need [to have] interoperability."

Locking IoT systems and smart devices into silos is clearly a problem for consumers, who can't always mix and match devices, but also for manufacturers and vendors, who have to "reinvent the wheel" each and every time they make a product. Interoperability "creates a fertile environment for innovation, and is essential if technologies are going to scale," said Justin Anderson, chairman of HyperCat's steering committee. "Interoperability ensures we can build systems that can evolve... and gives the buyers of systems confidence that they're not going to face vendor lock-in."

Plus, when device

manufacturers and app developers want to make services interact, it will require code. "If we have humans in the loop, writing software whenever anything wants to use anything else, that obviously doesn't scale, so we need to automate that process," Beart said.

## BROWSABLE DEVICES

HyperCat aims to do just that: automate the interactions between different IoT platforms by making data and services machine-browsable. It's an interoperability layer that lets an app find data to use, be that across the web or from sensors. A weather app could pull in data from the internet as well as from a temperature station, and interpret it, without human intervention.

It's a simple spec – only six pages – and uses existing standards such as HTTPS, RESTful APIs and JSON. To set it up, you publish the data on a web

server in the form of a HyperCat dialogue – a JSON structure that contains metadata and resources, such as pointers to data. That means other apps can find the data that's available, and the data can be locked down with keys, meaning







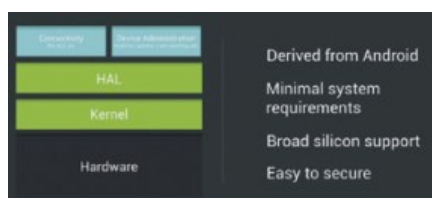
*"If we have humans in the loop, writing software whenever anything wants to use anything else, that obviously doesn't scale, so we need to automate that process"*

- ▲ HyperCat chair Lord Erroll wants to connect smart devices together
- Brillo is Google's play into the Internet of Things space, leveraging the massive scale of Android uptake

it's only shared with permission. "It's like building blocks: you can put them together to build anything," said Lord Erroll, HyperCat's chairman.

HyperCat doesn't solve every interoperability issue: if temperatures are collected and stored in Celsius, and an app searches for Fahrenheit, it won't work. But it does mean that an app can search for all temperatures in a particular format, and it highlights the importance of standardised semantics across IoT devices, right down to how time is displayed.

HyperCat also has backing from 50 companies, including ARM and



IBM. It doesn't have either Google or Apple onboard, however, and that's a major hurdle given that both firms are developing their own systems to make their mobile platforms act as a communications layer between smart-home devices and other IoT gadgets.

"HyperCatCity is a powerful example of where the rubber hits the road, when an entirely open, interoperable IoT specification is applied to real-life smart city challenges, building better

services for citizens and, ultimately, taking some of the friction out of people's daily lives," said Anderson.

Lord Erroll has maintained that the system has a lot of potential to join up disparate public services. "We have a lot of smart stuff in silos – smart water, smart energy, smart waste, smart lighting, smart lots of things – but it's in bits," he claimed at a HyperCat conference in June. "It's not all connected. The real benefits are when we start doing things across these areas, and the information starts to meet."

Whether HyperCat becomes an also-ran specification that falls by the wayside when Google's Brillo and Apple's HomeKit take hold remains to be seen. ●

## GOOGLE BRILLO VS APPLE HOMEKIT

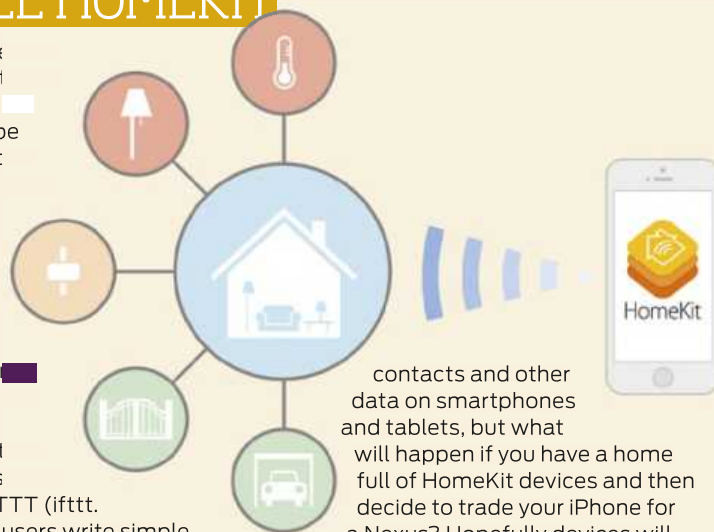
Your smartphone is set to be the centre of your smart home – meaning that Android and iOS aren't just battling for control of your phone, but your living room, kitchen as well as the rest of your house.

Google unveiled Brillo at its I/O conference earlier this summer. It's an operating system for the Internet of Things embedded into the next version of its mobile OS, Android M. Developers will be able to make devices and apps for smart homes that can interact via Brillo, and be controlled via your smartphone. If a smart fridge or connected security camera connects to Brillo, those devices will also be able to connect to one another via Bluetooth or Wi-Fi, via Brillo's Weave interoperability layer.

Apple last year announced a similar system for iOS called HomeKit. It's a software platform that lets devices

communicate via Wi-Fi or Bluetooth, or talk via a hub. Devices will be controlled either via their own app or by using the central HomeKit app. Hardware is only starting to arrive this summer, it's expected that HomeKit will operate in a similar fashion to IFTTT (ifttt.com), letting users write simple rules to make devices interact. HomeKit will also let you control devices via voice with Siri.

Apps now make it easier to transfer



contacts and other data on smartphones and tablets, but what will happen if you have a home full of HomeKit devices and then decide to trade your iPhone for a Nexus? Hopefully devices will support both Apple and Google's platforms, otherwise switching will become even more difficult than it is at the present.



# KILLER ROBOTS: WHO'S RESPONSIBLE?

A worker was killed by a robot at a VW plant, but experts suggest that, while tragic, his death was nothing more than a standard manufacturing accident

**R**obots are inching their way into our lives, but who's responsible when smart machinery ends a human life?

That question was raised following the death of a worker at a Volkswagen plant in Baunatal, Germany. The 22-year-old was killed after a robot he was fixing slammed him into a metal plate. The robot was a stationary piece of machinery that was normally kept inside a cage to do its work of picking up car parts and moving them.

Initial reports suggest that human error was the cause of the accident, rather than a flaw with the robot, but German news agencies said prosecutors were considering whether to press charges – but against who?

Bryant Walker Smith, an assistant law professor at the University of South Carolina, specialises in the legal implications of new technologies. He said the responsibility in such cases depends on who installed the robot and if they were properly trained, and whether the robot malfunctioned or acted in an unexpectedly dangerous way.

Ryan Calo, assistant law professor at the University of Washington and co-director of the Tech Policy Lab, said victims or their families would be compensated in the way they would following any manufacturing incident. "However, if the victim (or his survivors)

can show that the robot was unsafe despite work safety warnings and protocols, it's technically possible to sue the robot's developer."

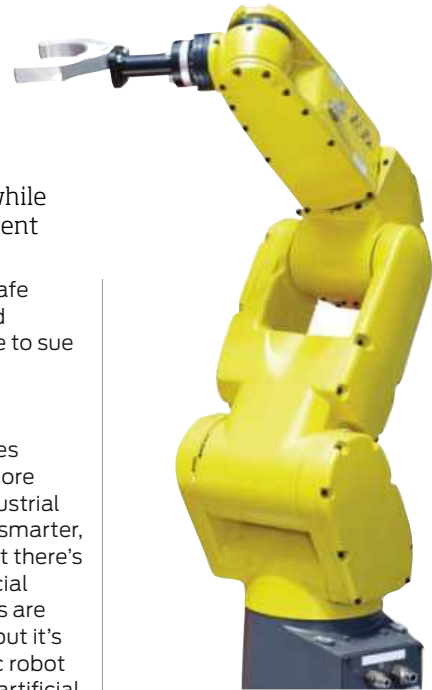
## SMART MACHINES

Responsibility for deaths or injuries caused by robots may become more complicated than a standard industrial accident as machinery becomes smarter, although Walker Smith noted that there's disagreement around what artificial intelligence (AI) means. "Robotics are already widespread in factories, but it's not clear that they (or the specific robot in question) possess any kind of 'artificial intelligence'," he said.

Calo said "liability for robot-related harm will become more challenging in several areas, including where robots are app-enabled like your phone, and when they display emergent behaviour – that is, behaviour unanticipated by design".

Both experts noted that the robot in Germany was preprogrammed and didn't feature AI, with Calo saying the accident was no different to a worker being killed by any other piece of industrial machinery.

"Industrial robots tend to be specialised tools, rather than the humanoid beings that many people think of when they hear 'robot'," added Walker Smith. "Humans have worked with – and been killed or injured by – industrial tools



for well over a century, alongside other tools long before that. Similarly, when humans work side by side with industrial robots, they face a risk of injury from those robots."

## MORE DEATHS?

Will the risk of death from robots increase as their use becomes more widespread? Each year in the US, there are one or two deaths by industrial robots, said Calo. However, it's hard to predict whether more accidents will occur as robots become safer but also more commonplace. Calo believes the real risk still comes from human malintent. "The most dangerous robots are those designed to be dangerous on purpose, such as armed drones".

## THE BEST OF THE REST

Here are the top stories from the innovations that are just over the horizon

### IN-FLIGHT WI-FI HITS HOME BROADBAND SPEEDS

Streaming HD video may be a pipe dream for many people living in rural Australia, but travellers will be able to do just that on Virgin America planes from next year. The airline is accessing the ViaSat-1 satellite via a Ku/Ka hybrid antenna, meaning it can offer in-flight internet access "at equivalent speeds to home broadband". [tinyurl.com/p2povas](http://tinyurl.com/p2povas)

### ASTRONAUTS TO FOLLOW THE BEARS

Researchers are studying how black bears hibernate to help astronauts master long space missions. The impact from extended

low gravity can damage bones. Black bears manage to avoid similar bone degradation during hibernation by suppressing the release of calcium from bones into the bloodstream – which researchers say could help inform treatments for astronauts in the future. [tinyurl.com/q2ur9jw](http://tinyurl.com/q2ur9jw)

### NEW YORK TO LONDON IN THREE HOURS

Concorde managed the New York to London trip in 3.5 hours, but a new supersonic jet could shave the flight time down to only three hours. Spike Aerospace's S-512 has a cruising speed of Mach 1.6 (1,963kph), but will have space for only 18 passengers. Flights are expected

to begin in 2018, with the company also planning to jet from London to Mumbai in four hours and LA to Tokyo in five. [tinyurl.com/njy5xq7](http://tinyurl.com/njy5xq7)



## WHY CAN'T WE PATCH OUR OWN CARS?

Security challenges mean car software bugs aren't usually patched over the air – but that may have to change

Land Rover, Ford and Chrysler have been forced to recall cars to patch software flaws, forcing drivers to bring vehicles into dealerships rather than get an over-the-air (OTA) update like a smartphone.

Ford recalled more than 433,000 Focus, C-Max and Escape cars due to a software flaw that kept engines running even after the key was removed. Land Rover is patching a bug affecting the locks on 65,000 cars, while Chrysler's Jeeps can be hacked in motion.

The software updates are free to car owners – if you discount the petrol and inconvenience. While some cars are already capable of OTA updates, there are security fears. "I certainly don't like the idea of a car receiving updates over the internet, because of the opportunities for that important data transmission to be meddled with by hackers," said security analyst Graham Cluley.

There have already been exploits. Earlier this year, BMW issued a patch to more than two million vehicles running its ConnectedDrive dashboard. A flaw in the update system gave hackers access to customers' cars. "Researchers discovered they were able to create a fake cellphone base station to intercept network traffic from the car, and use that information to send commands to the car telling it to lower windows or open the doors," said Cluley. "The way BMW had implemented

internet updates for its cars had itself introduced a serious security vulnerability."

There are other ways to update software, but none are foolproof. "It would be possible for owners to update their cars by plugging in a USB stick containing the software update," Cluley said. "Of course, this could be abused as well."

### MORE UPDATES ON THE WAY?

Updates may become more frequent because flaws are so common. Some weaknesses are actually built into the systems. Analyst Iain Wallace said regulations mean onboard diagnostic systems must be easy to access in order to prevent drivers being tied to their dealer. This includes getting new keys.

That means thieves could program a new digital "key", letting them open doors and start the ignition without a physical key. "However, this is by no means an easy task – it requires specific equipment and specialist knowledge, and is therefore related to 'professional' and organised car criminals," he said.

As patches become more common, manufacturers could be forced to move increasingly towards OTA updates, rather than a dealership visit, leaving security experts yearning to turn back the clock. "It feels to me that a lot of bells and whistles being put into modern cars aren't actually necessary for the core function of the car," said Cluley. "The Internet of Things is a security disaster."



## CROWDFUND THIS! SIRIUS IN-CAR DISPLAY

Our pick of tech projects on Kickstarter and Indiegogo

### What is it?

Unlike GPS, where you either listen to directions or look at them on a screen, Sirius puts directions on the windscreen, directly in front of the driver.

### How does it do this?

The Sirius TC+ is a display that adheres to your windscreen, providing a clear view of the road while also presenting directions. You can view incoming calls,



manage music and receive contextual information, such as the location of the nearest petrol station, local speed limits and road conditions.

### How big is it?

The first edition is a 12.1in display, but larger versions are in the works. It's essentially a film that attaches to your windscreen. With a resolution of 2,560 x 1,440, it connects over Bluetooth, Wi-Fi and 4G, and is powered by a 2.2GHz Snapdragon chip.

### I presume it runs on Windows? Very droll.

No – it's Android, alongside a proprietary OS called NUUK. We're assuming this means we can also fire up Google Play and watch a video from the comfort of our car.

### Is it legal to have this stuck on your windscreen?



The developer is hoping that the system will be installed in cars when they're manufactured. Some cars have similar systems built in already, with a few using mirrors to project your speed and satnav directly onto the windscreen. The Highway Code prohibits an "excessively dark" tint on a windscreen, and also states that it must be "free from obstructions to vision". While the Sirius seems to steer clear of both, it would be wise to call your insurance provider before installing.

### How much?

You'll have to pledge US\$620 for the 12.1in Sirius TC+; no pricing information is yet available for the larger sizes. The developers are also offering two other devices: the Sirius TT+, which is a 10.1in see-through tablet for US\$450; and the TX+, the world's first transparent smartphone for US\$1,200.



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Apps, essentials, full software, drivers & more!

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## LINUX

- + CLONEZILLA LINUX

**INSTRUCTIONS:** Open Windows Explorer, navigate to your DVD drive and double-click Index.html in the root directory. **DISC PROBLEMS:** To replace faulty DVDs, please send the discs to: **PC&Tech Authority DVD Replacements**, Level 5, Building A, 207 Pacific Highway, St Leonards NSW 2065

Make sure to include your name and postal address on the back of the package so that we know where to send the replacements. For all other DVD related issues email [cd@pcauthority.com.au](mailto:cd@pcauthority.com.au). As the delivery platform only, PC&TA and Haymarket Media cannot and will not provide support for any of the software or data contained on these discs. Although all discs are virus scanned, Haymarket Media cannot accept any responsibility for any loss, damage or disruption to your data or computer system that may occur while using the discs, the programs or the data on them. There are no explicit or implied warranties for any of the software products on the discs. Use of these discs is strictly at your own risk.

## FULL VERSION



## ASHAMPOO PRIVACY PROTECTOR

Ashampoo Privacy Protector 2015 is a collection of tools to help maintain your digital privacy.

A "System Cleaner" scans your system for application histories, leftover temporary files and other potential problems, covering Internet Explorer, Microsoft Office, Windows Media Player or just the operating system in general. You can review anything the program finds, and delete some or all of it with a click.

An "Encrypt" tool takes your confidential files and saves them into a password-protected archive.

There are one or two useful options to explore - you can have the program delete your original files after encrypting them, maybe save them in a self-extracting file - but a simple wizard-based approach keeps everything very straightforward. Help is available for this app, but you're most unlikely to need it as it's very straightforward to use.

## REGISTRATION & INSTALLATION:

- Download and run `ashampoo_privacy_protector_2015_19918.exe`
- After you launch the software, a prompt will appear requesting you to register.
- Click on "Get free activation key", this will open up a link in your default internet browser.
- Enter your email and hit the "Request full version key".

**NOTE:** If you have previously registered an Ashampoo product, please log in.

Once you have logged in, go back to within the application and click "Request FREE full version key" again and fill out the prompts accordingly.

Copy and paste your license key into the application, press next and complete the installation process.

Congratulations! You have unlocked Ashampoo Privacy Protector. For support of this software, please direct your queries to:

<https://www.ashampoo.com/en/aud/sup>

## REQUIREMENTS:

- Windows XP, Vista, Windows 7, or Windows 8
- 30 MB hard drive space

## LIMITATIONS:

- Registration Required.
- <http://www.ashampoo.com/>

## FULL VERSION



## AUSLOGICS BOOSTSPEED 7

Auslogics BoostSpeed 7 is a comprehensive suite of tools that will improve performance in just about every area of your PC's operations.

If your system is slow to boot, for instance, then use the Startup Manager to locate and disable unnecessary Windows startup programs, Explorer extensions and even IE add-ons for a comprehensive list. And BoostSpeed can highlight "dangerous" items, as well as programs it believes may be spyware, for an additional security benefit.

## REGISTRATION & INSTALLATION:

- Download and install `boost-speed-setup.exe`
- Start and complete the installation process.
- To register for your serial, point your browser to <http://boostspeed7.disc.pcauthority.com.au/>
- Log in or create an account.
- Once you are logged in, scroll down the product page and click on the "Get Serial Code" button.
- After the installation process has completed, run the software and you will see a "Activate Premium Version" at the top of the user interface. Click this and copy and paste your serial key.

**NOTE:** During our testing, we were not prompted to enter a license key. For support of this software, please direct your queries to: <http://www.auslogics.com/en/support/product/boost-speed/>

**BONUS:** Auslogics would also like to share a 3 month trial of BootSpeed 8 for you to try out. You can find this on the DVD menu at the bottom of Boostspeed 7.

- No registration is required. Download and install boost-speed-setup.exe

#### REQUIREMENTS:

- Windows XP, Vista, 7 or 8
- 100 MB hard drive space

#### LIMITATIONS:

- Registration Required
- <http://www.auslogics.com/>

#### FULL VERSION



**CYBERLINK PHOTODIRECTOR 5**  
PhotoDirector 5 is a capable editing and management tool for organising, editing and sharing your digital images.

Launch the program and you'll find it's split into five sections.

"Library" is where you import, view, rate, tag and generally organise your photos. There are plenty of time-saving tools on hand (face tagging, the ability to exclude duplicates when importing), but it's all very straightforward and easy to use.

The "Adjustment" section provides manual and fully automatic tweaks for colour, white balance, sharpness and more, as well as crop and rotate tools, along with various healing brushes and a red-eye remover.

The "Edit" tab then ramps up the creative possibilities with a range of more powerful tools. The People Beautifier provides options to whiten teeth, remove wrinkles, perhaps reshape your subjects for a more slimline look. The program can remove unwanted objects from pictures, automatically filling in the background. There are some simple effects, frames, a watermarking tool, and more.

When you're finished your work, the "Slideshow" section helps turn your photos into a video file, or a slideshow you can share directly on YouTube – very convenient! And the "Print" tab provides a great deal of control over any printouts you might want to make.

#### REGISTRATION & INSTALLATION:

- Start and complete the installation process.
- To register for your serial, point your browser to <http://phd5.disc.pcauthority.com.au/>
- Log in or create an account.

- Once you are logged in, scroll down the product page and click on the "Get Serial Code" button. This will display your serial key.

- After the installation process has completed, you will be prompted to enter your serial key. Paste the serial key and complete the registration process.

- For support of this software, please direct your queries to: <http://www.cyberlink.com/support/search-product-result.do?prodId=4&prodVerId=1123>

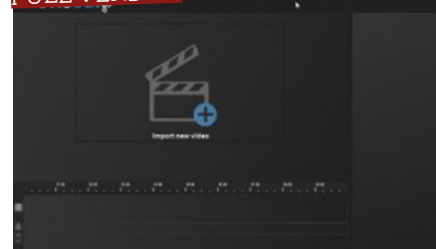
#### REQUIREMENTS:

- Windows XP, Vista, Windows 7, or Windows 8
- 500 MB hard drive space

#### LIMITATIONS:

- Registration Required
- <http://www.cyberlink.com/>

#### FULL VERSION



#### MOVIECUT 2015

Abelssoft MovieCut is an interesting video editor. It doesn't have the power of the market leaders – you're not going to use MovieCut to produce the next blockbuster

- but if you just want to process your latest mobile clip, it could be very useful.

#### REGISTRATION & INSTALLATION:

- Download and install MOC-W\_cs\_uk\_10\_2015.exe

**NOTE:** During our testing, we were not prompted to register the application. Here are the instructions provided to us:

- Get your registration code within the program. Note if you've previously registered any Abelssoft full product, you won't need to register again.

- For support of this software, please direct your queries to: <http://www.abelssoft.net/contact>

#### REQUIREMENTS:

- Windows XP, Vista, Windows 7, or Windows 8
- 100 MB hard drive space

#### LIMITATIONS:

- Registration Required
- <http://www.abelssoft.net/>

**FREE FULL VERSIONS:** Each month, we offer *PC & Tech Authority* readers full registrable versions of some software on the DVD. See the installation instructions in the DVD menu to complete registration, if applicable. **IMPORTANT:** Full product registration closes on 12/10/15



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### No 215 / October 2015

**FEATURE** +ASHAMPOO PRIVACY PROTECTOR+Auslogics BoostSpeed 7 +Auslogics BoostSpeed 8 + Cyberlink PhotoDirector 5 + MovieCut 2015 **DRIVERS** + ATI Catalyst + NVIDIA ForceWare **HELP** + Disclaimer + Damaged or Faulty DVDs + Using This DVD + Installing Software **EDITORIAL** + Burning an ISO Image + PC&TA Editorials **TROUBLESHOOTING** + Serial Codes + Blank Registration Website + Can't Find a File? + Installation Error **WINDOWS** + CCleaner + Classic Shell + CutePDF + Defraggler + Foxit Reader + Greenshot + Apple iTunes + Libre Office + Open Office + Malwarebytes' A/M + Sandboxie + VLC Media Player + Flux + 7Zip **MAC** + Alfred + BetterTouchTools + Apple iTunes + Dropbox + Flux + Google Chrome + Mozilla Firefox + Plex + Skype + TeamViewer + VLC **INTERNET** + Vuze + Dropbox + Google Chrome + Mozilla Firefox + Mozilla Thunderbird + Skype + Steam **LINUX** + Clonezilla Linux

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Make sure to include your name and postal address on the back of the package so that we know where to send the replacements. For all other DVD related issues email [cd@pcauthority.com.au](mailto:cd@pcauthority.com.au). As the delivery platform only, PC&TA and Haymarket Media cannot and will not provide support for any of the software or data contained on these discs. Although all discs are virus scanned, Haymarket Media cannot accept any responsibility for any loss, damage or disruption to your data or computer system that may occur while using the discs, the programs or the data on them. There are no explicit or implied warranties for any of the software products on the discs. Use of these discs is strictly at your own risk.



## JON HONEYBALL

# "SOME PEOPLE HAVE BEEN PONDERING ALOUD WHETHER MICROSOFT IS ABOUT TO WALK AWAY FROM THE HOME MARKETPLACE ALTOGETHER"

If there's no money to be made from home users, would Microsoft be wise to move its focus entirely to the business space?

The tension is mounting and the band is about to start playing – as I write, we're days away from the final release of Windows 10 – although by the time this issue of PC & Tech Authority is in your hands the final Windows 10 will be out, and perhaps already on your drive. The latest build, numbered 10158, has just been released to those on the fast-track beta-testing cycle, and I had no problems downloading it onto my virtual machine running on VMware Fusion on my Mac Pro. I also keep a sacrificial Ultrabook – a ratty Toshiba device – that has the same build installed on it, but my focus is mostly trained on the VM.

Why? Because it's easier to fix things in the event that something goes wrong: simply roll back to a previous snapshot and you'll be back up and running in a few seconds. I've said this before, but I'll repeat: the lack of any meaningful push to redesign Windows so that it can run in a multi-ringed VM architecture might end up being its downfall. I understand that it's not necessary in business environments, where most things can and should be under centralised control, but in a home environment we need more protection than is offered by a base OS.

There's been talk about whether Microsoft is about to walk away from the home marketplace altogether, retreating to the professional services (SMB, large corporate) space. Such chatter has been prompted by various asset sales – including a huge write-off over Nokia, which is arguably long overdue – and the creeping reality that there isn't any money

to be made from home users.

This points to a radical conclusion: if Windows 10 doesn't ignite the imagination of home users – if, despite being offered a free upgrade, many stick with what they know – it's not beyond the realm of possibility that Microsoft might scale back Windows, turn it into a bootstrap loader for Office and the new Edge browser, lock it all down, and walk away from third-party apps entirely.

When this idea was first mooted, I gasped and smiled. Gasped at the

*"The lack of any meaningful push to redesign Windows so that it can run in a multi-ringed VM architecture might end up being its downfall"*

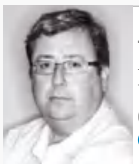
audacity of the thought process that finally acknowledges that home users might not be coming along for the ride, and that there are huge costs attached to providing them with functions they clearly don't want. I smiled because I recalled saying the same thing in this column years ago.

Frankly, I think this is too radical a stance for Microsoft to contemplate, although Satya Nadella doesn't seem overly afraid of grasping the nettles he inherited from Steve Ballmer. There's much to be said for blue-sky thinking and, if you pose the question, "What OS platform would you need if your goal were to support cloud-based apps to which your customers subscribe?", the answer may not be a behemoth such as Windows 10.

Of course, there remains a huge place for a third-party development community, but one wonders how much of it will be for businesses only in the future. Give home users Office 365, a smattering of tightly locked-down apps such as Facebook, Twitter and a shiny new browser, then ask them whether they actually need anything more. Merely asking the question, let alone having the guts to try to answer it, is something that will doubtless keep senior Microsoft executives awake at night for months. Even if the answer is "no", it's still a valid question. The problem is, that answer leads to further questions: "What does a home user need that they haven't got on their iOS or Android tablet?"; "Do you prefer locked-down security to historical backwards compatibility, given that you may still have old Windows 7 hardware to hand?"

So, what's 10158 like? Well, it's better than previous builds, and some might argue it's the first that's fit to use for real day-to-day work. I wouldn't disagree. Microsoft itself is claiming it "has no significant issues", which is a phrase that's open to interpretation. History shows that products are released according to a time-based – not a quality-based – schedule. Of course, it would be unthinkable to knowingly release a product with already-discovered mantraps present, but it's hard to know where to draw the line when it comes to secondary and tertiary problems, especially those that are of a largely cosmetic nature.

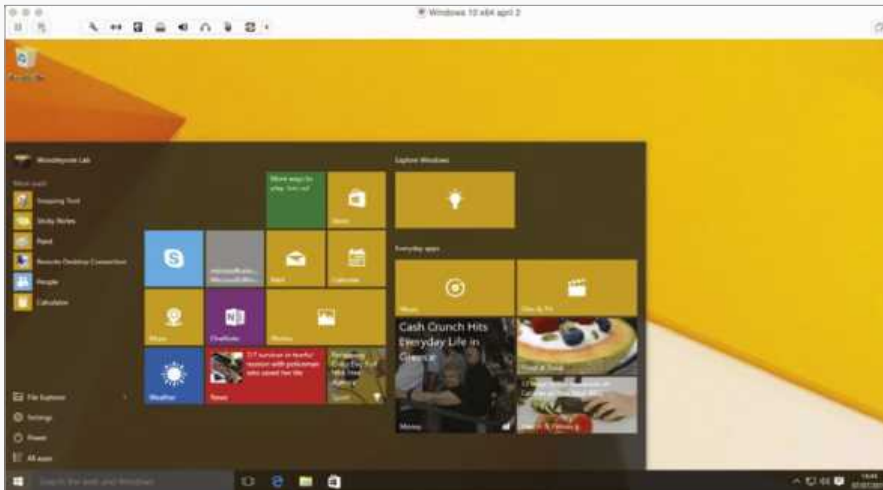
I've said this before, but I'm concerned about what's starting to appear to us outsiders as almost a crash-landing of the product, where everything attempts to come together at the last minute. But let's not get too negative; the product must be judged on what ships on the day



**JON HONEYBALL**

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@jonhoneyball





of delivery.

I remain confident that Windows 10 will work out alright, and that customers should move to it – whether from the safe haven of Windows 7, or from the painful migraine that is Windows 8. And move to it considerably more quickly than many have done for previous versions of Windows: yes, I'm looking at those still running XP, for which there are simply no more excuses in a business context. Even in those rarified areas of highly specific hardware-compatibility issues, time has moved on and the support cost for the old hardware might well now be overwhelmed by the support cost of keeping XP on it.

## WIFI NON-SENSE

There's recently been quite a storm about a new facility in Windows 10 called Wi-Fi Sense. The basic idea behind it is that you can share Wi-Fi passwords with your friends and family, so that they can automatically gain access to the network you share without needing to know its password. It's one of those ideas that looks good on a whiteboard, when the product team is brainstorming ideas on how to make things easier for home users.

And it really is rather clever. You can share this information with your Outlook.com friends, your Facebook friends and Skype contacts too. The information is wrapped up into an encrypted file that's stored on Microsoft's servers, and can then be accessed by your various buddies.

All of which is just tickety-boo, except for a number of small problems. First, you can enable or disable access to any one of those three groups, but that's it in terms of granularity. It's impossible to grant access to only a select few within one group. This lack of fine granularity is hopeless, and shows once again how design by committee can get out of hand

very quickly. I'd like to believe that the development team behind this feature had a long list of "must do's" – including individual access rights – but that they didn't quite get round to that one, so what's been finished is what's being pushed out of the door.

There is a workaround: change your Wi-Fi base's SSID so it tells Windows 10 not to take any notice of Wi-Fi Sense. To do this, add "\_optout" to the end of its current name, so your SSID of "SpankingCottage" would become "SpankingCottage\_optout". That is, unless you're also opting out of Google Maps, which uses "\_nomap" as an opt-out, giving you "SpankingCottage\_optout\_nomap", which I'm sure you'd agree looks like a total kludge of the worst sort.

Oh, and when was this introduced? It's new to the desktop version of Windows 10, but has apparently been in Windows Phone 8.1 for a while. Not that anyone noticed of course, because sales of that platform are so low that they're lost in the noise.

## CISCO MERAKI

Last month, I mentioned that I was pulling out my existing firewalls and Wi-Fi base stations. I've run a very expensive FortiGate firewall here at the lab for a number of years, and it has done good service. It coped admirably with a great deal of traffic over the 100Mbps/sec symmetrical fibre connection, for example, whereas lesser firewalls simply choked on the throughput.

When I had a look around and talked to friends in the know, one name kept cropping up – Cisco Meraki. Everyone has heard of Cisco, of course – but it's a brand and technology that I've actually tried to steer clear of. Not because of any problems per se, but more because it has a reputation for being fiendishly

< Take the plunge – and move across to Windows 10 as soon as possible

complicated, requiring specialist skills.

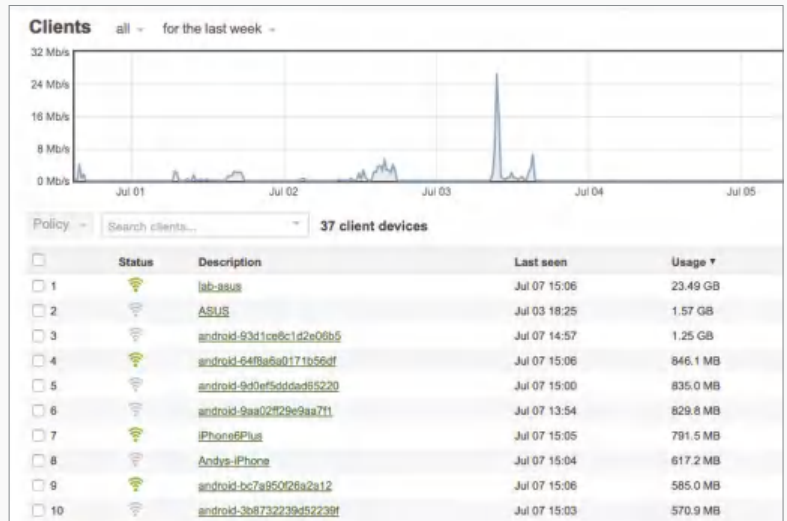
Meraki is different, however. It was acquired by Cisco a few years ago as a leading-edge cloud-based firewall, Wi-Fi and switch-management platform that controls its own hardware. I was intrigued.

My thinking was as follows. Firewalls handle important security on the network. These devices are complex to set up, and you can't always be certain that you've done so correctly. And although I pay an annual maintenance fee for rolling firmware upgrades, the device doesn't update itself – this will happen only if I remember to do it. In our modern world of ever-changing threats, a device whose primary role is security but that's updated sporadically whenever I remember, isn't such a great solution. Far better to have something where firmware and management is pushed onto the device in real-time.

On the Wi-Fi side, I've been using a mixed bag of base stations – including Apple AirPort Extreme devices – for a number of years, but with a decent load (especially from a number of clients simultaneously) many seem to choke. Clearly I wanted to look at devices that could handle a school, a university, a conference centre.

I placed an order for a number of Meraki firewalls and Wi-Fi bases with Jason at BridgeSolutions. The boxes they came in were somewhat surprising – small, beautifully built and complete with wall-mounting hardware, screws and carefully designed templates to show how to mount them.

With the Meraki system, you perform a cloud-based login to a comprehensive web console. From here you can add the hardware that you've just bought and configure how you want it to work, and then it all gets saved. Apart from the initial setting up of the firewall, you won't be touching the hardware itself – everything is managed from the cloud, and thus via the cloud console, which means that you can manage it all from the other side of the world while on holiday. You don't need to expose your firewall-management interfaces to the outside world in order to get in and configure it, nor leave open holes through the firewall to let you gain access to some internal terminal server. You don't need to run a third-party remote-access app either. Just connect to the cloud console, do your work, and it's automatically and immediately dispatched to all the devices.



^ Apple's Beats 1 radio station had a strange effect on the quality of sound being pumped out of my iMac

Getting the firewalls up and running is easy. Simply connect a computer to the local port, log in to the firewall and give it the details of how it connects to the net. This could be through either a direct IP connection – where you'll need to provide the IP address and so forth of the upstream router – or it could be a PPPoE login, in which case you'll need to provide the appropriate login information. Once this is done, a little miracle occurs: it logs in and downloads new firmware, then pulls down the definition that you've created at the Meraki cloud. This only takes a few moments, and then it's up and running.

Getting the Wi-Fi units working proved even more simple, as I'd already defined the SSIDs and security settings that I wanted (you can have up to 16 SSIDs per base unit on the devices I bought, and you can manage and throttle each one independently). Just plug it in, and it powers up, connects to the cloud and pulls down its configuration. Want something even better? Tick a few boxes in the UI – it really is no more than that – and the system automatically sets up site-to-site VPN tunnelling for you.

An iOS applet is available for keeping an eye on everything, which displays all the details you need. You can drill down into particular devices, specific loads, throughputs and so forth. It presents you with all you need to keep an eye on what's happening and, once again, this interface travels with you.

So far I'm extremely impressed: this system is a generational shift in terms of operation, management and configuration of such devices. Everything that came before now looks as quaintly obsolete as gaslight.

Now for the cost. The firewall is priced

at around \$600 and the Wi-Fi unit costs around \$440. You'll need a rolling subscription to the Meraki cloud – the devices won't work without it, so please bear this in mind – but this isn't exclusive to Meraki; the fact is that any serious firewall or networking infrastructure will require an ongoing, paid-for maintenance contract. A three-year licence for my three firewalls and four Wi-Fi units comes in at around \$880 per annum, which compares well to the \$400 I'd been paying for my FortiGate licence (although that does include hardware replacement too, if needed). In any case, these costs are pretty trivial.

I'd even go so far as to say that this combination of Meraki firewall and Wi-Fi units should be the de facto installation in any home environment. Do you really trust the firmware in that router that your ISP sent you? I don't, and putting my own firewall between my house and such a device seems like a good idea to me.

Okay, this isn't as cheap as a plastic box bought from your high-street retailer for fifty notes, but you really do get what you pay for. I'll report in a future column about how I'm getting on with this new setup. I've just noticed that these Meraki Wi-Fi units can automatically create a mesh network with one another, too, to extend their range – which is something I'll definitely be trying out.

## APPLE MUSIC

So Apple Music has finally shipped. I tried listening to it this morning and found the new Beats 1 "radio station" to be as annoying as I'd feared. This is entirely down to my being a grumpy old man, of course – watching Kanye West wander around the Glastonbury stage shouting into a mic nearly resulted in me throwing something at the TV.

Once I'd arrived in the office, I thought

^ Meraki's web console is cloud-based, and so can be managed from anywhere

I'd give Beats 1 another chance. I fired up the new 10.10.4 OS X Yosemite build, complete with the newly enhanced iTunes, and then clicked through to Beats 1 – and something odd happened.

Instead of my usual magnificent sound quality, I was presented with weedy, strangled sounds emanating from my iMac. The AirPlay button had disappeared. If I went back to some local music, the button reappeared and AirPlay started working. Back to Beats 1 and it was gone again.

This is really rather annoying, because there's simply no comparison between the speakers built into an iMac and the truly wonderful sounds you get from a network-connected Naim Mu-so – the true Rolls-Royce of network playback speakers. (Or perhaps better "the Bentley of...," given that Naim actually supplies Bentley with high-end systems for its cars.) This has to be a bug.

There is a workaround, one worth remembering for future use, which is to hold down the Option key while clicking on the Volume icon. The menu switches to a destination selector, and you can choose to route all audio output to an AirPlay device. My music returned, but now all my system beeps and bleeps ran through the Mu-so too, which isn't ideal.

In fact, holding down the Option key while clicking can expose all sorts of useful hidden features in OS X. Pressing Option while right-clicking on the Finder icon adds a "Relaunch" menu item to the list, which is handy if you want to force a restart of the desktop or finder. Holding down Option+Command while opening an Aperture library forces a rebuild of the picture database – a combination that works with the new Photos app, too, for the same function. ●

## PAUL OCKENDEN

# "KNOWING THAT YOUR PERSONAL DETAILS AND BUSINESS SECRETS ARE PROTECTED IS SURELY WORTH \$400"

Three out-of-the-ordinary USB products have impressed this month, from a secure flash drive to an external Wi-Fi dongle

This month, I'll be running through some of the more unusual, esoteric and useful USB gadgets on the market – and I'm talking about "proper" USB here, not the silly USB Type-C variant that isn't backwards-compatible with anything.

Don't get me wrong – I don't mind the introduction of new connectors, but please give them new names such as Lightning or Thunderbolt. Calling the latest flavour-of-the-month connector USB Type-C is bound to cause confusion among the non-techie peripheral-buying public, many of whom can barely cope with the size differences between standard, mini and micro. Throw in something completely new that handles video as well as power and data and you'll have them really scratching their heads. A new connector most definitely needs a new moniker.

Anyway, in no particular order, let's take a look at the first three of the USB gadgets I've bought or had sent to me in the past few weeks (I'll look at another three next month). First up is a brilliant USB power meter. I can't give you a name or model number to look up online because, as is the way with much of the low-priced tech coming from China at the moment, such details don't exist.

Indeed, the more I investigate this market sector, the more I realise that model names are the creation of a marketing department; when such a department doesn't exist, neither do any comprehensible product identifiers.

You'll find the meter I'm talking about listed at various online sellers – such as Banggood and DX, as well as eBay and Amazon – with a name like "OLED USB Power Meter". It's probably easiest to spot it by comparing the online product photos to the photo on this page.

The device consists of a printed circuit board, about the size of a memory stick, with a USB plug at one end, a socket at the other and an oblong OLED display between. It's all very neat, employing surface-mount device construction with none of the badly soldered components you'd have found on cheap Chinese kit a few years ago.

But why would you need such a device? Well, it's great for testing mobile chargers – more specifically, for determining exactly how quickly a particular charger replenishes your phone or tablet. You may suspect that one charger takes longer to top up your phone than another; this device gives you data with which to confirm or debunk your suspicions.

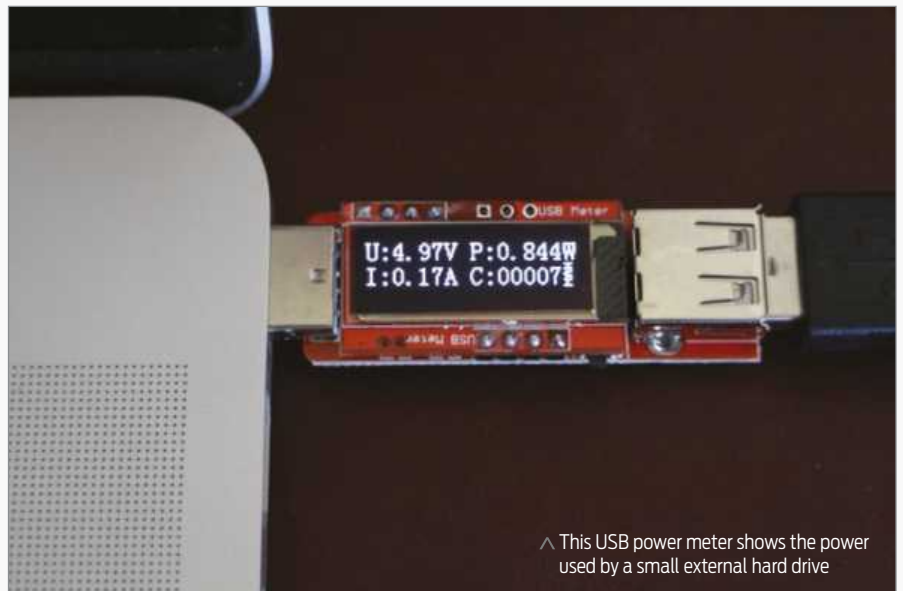
Various USB power meters are available, but I particularly like this one because of its clear display. Four data items are displayed simultaneously: the current from the USB port; the voltage; the power (the product of voltage and current); and, coolest of all, a cumulative power reading in milliampere-hours (mAh), which is great for checking whether the capacity of the battery in

your phone or tablet is really what it claims to be. If my tests are anything to go by, it may not be.

Speaking of exaggerated capacity claims, those rechargeable battery packs sold as emergency power sources for your phone are the worst. I have one here that claims to deliver 50,000mAh, but it takes only 20,000mAh to fully charge it, after which it delivers 15,000mAh before it's exhausted. This is still a reasonable number of charges for your mobile phone, but it's nowhere near the figure quoted on the packaging.

In addition to testing phone chargers and batteries, the USB power meter is also useful for checking the USB ports on computers, consoles, media streamers and similar mains-powered gadgets to ensure they're supplying the required voltage. You could do this job using a bodged-together USB extension lead on your multimeter, but this gadget makes the task much easier and neater.

The power meter is sold as a fairly industrial-looking barebones stick, as described above, or encased in tinted plastic housing. I went for the former because it was cheaper. You'll find



△ This USB power meter shows the power used by a small external hard drive



**PAUL OCKENDEN**

Paul owns an agency that helps businesses exploit the web, from sales to marketing and everything in between [@PaulOckenden](#)





*“The datAshur is completely independent of the OS and the platform being used to access it”*

the devices on sale for as little as \$6 although some vendors seem to want \$40 for them. Don't pay any more than you have to – they're all exactly the same. Three quid is amazing value, given the quality and utility of this device, which has now become an important part of my technology toolkit.

### SECURE STICK

From the cheap to the fairly expensive – or, at least, that's how it might appear. How much would you pay for a 60GB memory stick? Perhaps \$30? What if I told you there's one on the market that costs over \$400? It's not gold-plated or diamond-encrusted, but it's rather special all the same.

The flash drive I'm referring to comes from a company called iStorage and is known as the datAshur. It comes in various capacities from 30GB to 240GB, and it looks a bit like a fat USB memory stick; if you think back to the earliest USB sticks, you won't be far out.

What makes the datAshur SSD special is its built-in security. iStorage has a reputation for supplying secured storage to government agencies and the like, and the datAshur has put such technology within easy reach of small- and medium-sized enterprises (SMEs), and even home users. Yes, \$400 is a lot for a 60GB memory stick, but it's a small price to pay to protect your valuable data, be it company secrets or personal banking details.

What makes the datAshur different from many of its competitors in this sector is the fact that you don't need to install any client software to use it. The trouble with devices that employ client software is that they're susceptible to compromise by keylogging trojans. Also, such devices aren't easy to use at, say, a customer's site with restrictions on installing third-party software. The datAshur is unlocked via a keypad on the device itself, which makes the device more secure – and completely independent of the OS and the platform being used to access it.

Its high-end security features include protection against brute-force attacks,



^ You interact directly with the keypad on the iStorage datAshur, so no client software is needed

by adding time delays between failed attempts and wiping the device after too many attempts. It even has a special “distress” mode: type in a particular code and the device will instantaneously wipe itself.

Data is accessed using PINs, which can be between eight and 16 digits long, and the manufacturer has helpfully printed the telephone-style letter sequences – 2=ABC, 7=PQRS and so on – next to the keys. From a mnemonic point of view, this makes it easier to employ alphabetic passphrases rather than hard-to-remember long numbers, thus avoiding the temptation to use memorable phone numbers instead, which is an obvious security risk.

There are two login modes – Admin and User. Admin mode allows you to configure the various security and operational parameters (such as how long the device waits before going to sleep), while User mode is simply for unlocking the device. Once unlocked, the device behaves like any other USB 3 memory stick. Its read and write times are decent – probably around half that of the fastest sticks on the market, but certainly not slow.

As soon as you unplug the device, or power down your computer or allow it to hibernate, the device locks itself. Security-wise, the drive is encrypted

using 256-bit XTS-AES, which is all done in hardware. The cryptography parameters and passwords themselves are protected using SHA-256, and as further protection the aluminium housing is filled with epoxy resin to protect against physical dismantling attacks. As encryption is applied at full-disk rather than file level, you can format the device using whichever file system you prefer, and you can even use it on a smartphone or a tablet if you have an OTG cable.

We often hear reports about data breaches caused by employees leaving USB sticks on trains or in taxis, but the iStorage datAshur eliminates this problem – and the accompanying bad publicity that's potentially more damaging – while SMEs and home users can enjoy peace of mind. The ability to sleep well, knowing that your personal details and business secrets are safely protected from prying eyes, is surely worth a relatively paltry \$400.

### FASTER WIRELESS

People often invest in a faster wireless router only to discover that the connection to their laptop from the other side of their house or office remains much the same. There's a good reason for this. While a newer router may support faster standards and technologies, the wireless network adapter inside your laptop or device must support the same standards in order to work properly.

This caught me out recently. In my case, I was using – and continue to use – an Asus DSL-AC68U as my broadband router at home. It's an excellent piece of kit, especially if you have fibre-to-the-cabinet (FTTC) broadband, since it will replace your Openreach modem as well as the wireless router. It also works with cable broadband connections, and it's capable of 1,300Mbps/sec on the 5GHz band and 600Mbps/sec at 2.4GHz.

This is all very well, but my MacBook Pro (a late-2012 Retina model) was only connecting at around 13Mbps/sec from a couple of rooms away. This was because my Mac's network card only went up to 802.11n and lacked the fancier 802.11ac needed for faster speeds. Plus, although it supported the 5GHz band, the signal strength was so low that it was continually flipping back to 2.4GHz.

There are two ways to solve a problem such as this: upgrade the MacBook's wireless card or plug in an external Wi-Fi dongle. Me being me, I did both. Various

sites told me that I wouldn't be able to upgrade the network card, but in reality it was easy – I bought the same card that's used in the most recent MacBook Pro from an eBay vendor for \$50 and simply swapped it out (for anyone curious, the part number is BCM94360CS).

You'll need a pentalobe screwdriver to open the MacBook's case, which you can pick up for a couple of quid. You must be ultra-careful when detaching the antenna-connection plugs from the old card and reattaching them to the new one, which is quite fiddly (make sure you feel the leads click into place when reattaching). Apart from that, it's a quick – ten minutes maximum – and easy job.

So, what extra benefit did this give? Well, if I look at my connection speed right now, I'm seeing 217Mbps/sec, which is a fairly healthy increase on 13Mbps/sec. Incidentally, the quickest way for all you Mac users to see your wireless connection speed is to hold down the Option key and click the wireless icon in the status bar: you'll find that as well as the usual menu options you'll also see details about the wireless channel, your speed and more.

## FASTER STILL

But what if I want to go faster than 217Mbps/sec? Well, that's where I return to this month's topic – USB devices. Various manufacturers sell USB wireless network cards, with basic ones costing beer money and more elaborate models costing a fair bit more. Because the objective here is maximum speed, we'll look at one of the higher-end ones. While many manufacturers offer

▽ Hold down Option on your Mac keyboard while clicking on the wireless icon to see a wealth of useful information



them, your safest bet is to go with the manufacturer of your wireless router, since the components are more likely to co-operate nicely and give the highest speed possible. There's an important caveat here, though, which is to make sure the adapter comes with drivers for the operating system version you're using. For example, not all adapters ship with drivers for Mac or the latest of Windows. Anyway, I went for an Asus device to match my router.

Asus offers a confusing array of devices – I've just counted four with 802.11ac on available for purchase online, far more than from any other manufacturer. I chose the Asus USB-AC56, which offers up to 400Mbps/sec at 2.4GHz and 867Mbps/sec at 5GHz. Most importantly for me, it includes a separate, adjustable antenna, and also a small "dock", so you can position it a few feet away from the noisy radio-frequency environment of a typical

*"The quickest way for all you Mac users to see your wireless connection speed is to hold down the Option key and click the wireless icon in the status bar"*

PC or laptop. When I hooked this up to my aforementioned MacBook Pro, the connection speed almost quadrupled from 217Mbps/sec to 867Mbps/sec.

## MAC HACKERY

Incidentally, the USB-AC56 installed just fine with most recent versions of Windows, but I had problems with OS X 10.10 Yosemite. At the time of writing, its drivers only go up to 10.9 Mavericks, and the 10.9 installer refuses to work on 10.10. The underlying code is fine, though, so you can easily get it running with a bit of hackery. To do that you'll need to extract the installer, then open a terminal window and type "cd" into this folder. Now run "pkgutil --expand installer.pkg installer.pcta"; this will create a new folder called "installer.pcta" containing the driver and the network utility. The driver will be called rtl8812au9.pkg; you can view its contents by right-clicking. Inside, you'll find three folders, one of which is the payload.

Now, go back to your terminal window



△ The Asus USB-AC56 has a handy dock that allows you to position it away from your computer

and type "cat", drag the payload file into the terminal window, so that it copies the filename including the path, then extend this name by typing "| gzip -d | cpio -id" on the end. When you hit return, you'll see a message such as "8196 blocks"; if you move up a couple of folders in your Finder window (to where you originally entered "cd" in your terminal window), you'll see a new file called rtl8812au9.kext. KEXT files are the drivers needed by your Mac.

The easiest way to install the kext file is to download Kext Drop from tinyurl.com/nooeqke. This does exactly what it says on the tin: just drag in the kext file and the app will install the driver for you. Next, repeat the "cat [full filename] | gzip -d | cpio -id" command on the payload of the wirelessnetworkutility.pkg file, which will create a Wireless-AC Network Utility app that you can then drag into your Applications folder.

You'll need to reboot your Mac now, but after this you'll find that when you plug the USB-AC56 into your Mac you're able to run the Wireless-AC Network Utility to connect to your router.

I realise this sounds like a palaver, but you'll only have to do it once, and it's well worth it for the additional network speed, which makes things such as backing up to a NAS drive far faster than when using the built-in networking (which you should now switch off by clicking the icon in the status bar – otherwise, your Mac may still continue to use it, despite having a faster connection available).

So, there you have it: three different USB devices, all interesting in their own way and each most useful indeed, plus a bit of fun to muck around with some tweaking. I hope you enjoyed the trip, because next month's column is going to visit another three...●



## TONY FAULKNER

# "A REEL-TO-REEL RECORDER WEIGHED SO MUCH WE HAD TO EMPLOY FOUR PIANO-MOVERS TO CARRY IT UPSTAIRS"

How have tech developments shaken the music and video industry, and what does it all mean for consumers?

Professionals in few industries have escaped the impact of the internet and 21st-century tech, so why should my little business escape? The music industry, where my company operates, has been knocked sideways by electronic delivery displacing packaged media such as CD, as though no-one had seen it coming. Our industry's marketing strategies are being reworked – the function once performed by packaging is now done by web pages and social media strategy, with high-quality video and photo promotional content gaining importance.

The biggest shift overall is surprisingly not about accessibility, tech or marketing: it is the over-a-cliff-like drop in profitability for musicians and labels from new recordings. In the absence of a clear strategy for the future from record companies, the new tech companies have taken the initiative – which unsurprisingly benefits and suits them foremost. Performers have shifted to earning from concerts and tours. In our specific area of classical and light music, we see fewer large-scale recording projects being funded; instead, small-scale projects are being recorded, mainly intended for sale at concert events.

Audio technology has been going through many changes over a long period of time, ever since I first moved away from analogue tape (when I got my hands on a Sony PCM-1, way back in 1977). In the 1980s, if a client wanted 24-track recording we had to rent a Sony PCM-3324 reel-to-reel recorder. It weighed so much that when we recorded in the Musikverein in Vienna we had to employ four piano-movers to carry the beast up



four flights of stairs – the recorder was too heavy for the hall's lift.

Our favourite replacement of today is the JoeCo BlackBox; it weighs just over 2kg, in comparison with the Sony PCM-3324's 300kg. This innocent-looking 1U rack-mount box is available in several configurations, and the one we use is a 24-track recorder with analogue and digital interfaces to record directly to an external USB hard drive or fast USB flash drive.

As a track-laying tool the JoeCo is bombproof, straightforward to use and – crucially – independent of a PC, Mac or laptop. I'm not alone in having experienced nail-biting moments minutes before the start of a concert, when our laptop's operating system has chosen an unhelpful moment to reboot after installing updates. The last time was in the Royal Albert Hall when an error message appeared onscreen, followed by a Blue Screen of Death – while a mass of choirs, orchestras and audience was singing "Jerusalem". Thank goodness I had an independent analogue monitor mix that was going as a backup directly to the audio tracks of one of our cameras.

^ No more 300kg reel-to-reel recorders need to be hauled to concerts: we now use this 1U JoeCo recorder

PCs and Macs are fine in the post-production studio, but they scare the life out of me on location at a live concert.

## MOVERS AND SHAKERS

In audio, another development that is still defining itself is network audio – AES67, Dante and Ravenna. Watch this space: for me this technology is still just on the brink of something I need and can trust, as manufacturers sort out mutual compatibilities and standards.

When it comes to microphones, a special interest of mine, very little has happened for some time except for a few specific new feature sets and refinements. First of interest to videographers is the range of dedicated "video" microphones from RØDE. Many videos are wrecked by poor audio, which is an unfortunate irony. Most DSLRs and camcorders have inadequate onboard microphones. RØDE has grabbed this bull by the horns and produced some excellent bolt-on mics. The same manufacturer has recently released an



### TONY FAULKNER

is a Grammy-winning recording engineer who has worked with orchestras, ensembles and soloists around the world. He runs Green Room Productions, London



*“Whether 4K will achieve huge success in Australian homes is hard to predict, but it is making its mark in the film industry”*

active phantom-powered ribbon studio microphone that I've fallen for. It's great to see one British and two Australian high-tech companies (JoeCo, Atomos and RØDE) leading their markets.

I've worked in high-quality video for years, but I'm still blown away by the sight of my Sony Alpha A7S VDSLR in a SmallRig cage with its 28-135mm G lens and Shogun monitor/4K recorder. The pictures are progressive and as good as I have seen from many professional broadcast cameras, at a far less scary price – unless you have a studio already full of cameras you're still paying for. In low light, the A7S flattens any camera I've used. In the dark, it can resolve detail and colour better than most human eyes.

DSLR cameras have long tried to make decent video as a “bonus” extra, but there have been bugaboos of Moiré patterns from data-binning – especially models with small sensors, which deliver grubby noise and grain in poor light. Cameras such as the Sony A7S and A7RII are in a different league, along with many of the new CMOS-dedicated video cameras.

And the improvements keep coming. Yesterday the postman delivered a SanDisk 960GB SSD to install in a cartridge for our Atomos Shogun video monitor/recorder, which in storage terms represented a movement of earthquake proportions. The Shogun recorder is a breakthrough device and works with Ultra HD 4K video as well as conventional 1080p. The 960GB SSD's specification includes read/write speeds in excess of 500MB/sec – all for less than \$600. To someone accustomed to proprietary,

expensive and lower-capacity memory cards, this is excellent news. The SSD is fast enough to attach it directly to your workstation for editing.

### COLOUR AND 4K

A big new issue for us in video concerns colour management. For years video lived in a world dominated by Rec. 709, defining televisions' and broadcasting colour space. Cinema projectors, computer monitors and printers don't use the limited Rec. 709 colour space, and nor do the latest high-end 4K televisions, where the push is for Rec. 2020. The new practice for videographers is to shoot video raw or using a logarithmic picture profile such as Sony S-Log2, S-Log3 or Canon C-log. The pictures viewed through the camera's viewfinder look like greyscale with washed-out colour, but when you apply a suitable lookup table (LUT) in your external monitor or in post-production, everything comes back to life.

This procedure means you record more dynamic range from the camera sensor, and are free to make decisions later about subjective textures, colour space and how to manage problems such as clipped highlights in parts of the picture. For 4K projects using our Sony-plus-Atomos camera, we record S-Log2 and set the monitor to view via a selected LUT. However, while most of our work remains HD, we still use in-camera Rec. 709 because our projects have no budget for lengthy colour grading.

Whether 4K will achieve huge success domestically in Australian homes in any hurry is hard to predict, but it is making its mark in the film industry and the pictures can be fabulous. It looks good in sport broadcasting, too. I've seen 4K video from the World Cup, Wimbledon and the Winter Olympics, and it looked stunning, especially the detail in wide shots. 4K video is equivalent to a continuous stream of 8-megapixel stills and the quality is convincing. Many moviemakers are reluctant to shoot at a frame rate faster than 24fps, but even at that rate the results are great.

Several issues remain for 4K in the home, not least three different standards of HDMI connection so far (1.4, 2.0 and 2.0a). Now we have HDR and Dolby Atmos audio to think about too, and a future of better interconnections such as USB Type-C.

### AN AUDIOPHILE'S PLEA

As a PC & Tech Authority reader, I suspect you're much more likely than most to care about audiophile sound, and I can't ignore this opportunity to bang the drum for higher quality in delivery of recorded



△ Sony's A7S camera with Atomos Shogun monitor/recorder is a match for much more expensive studio equipment

music. People like me and my colleagues expend a lot of effort to deliver high quality to our customers, and what crawls out at the other end of the tunnel can be soul-destroying.

Caring photographers know that crushing a beautiful picture from their beloved DSLR into a tiny JPEG is similar to the effects of acquiring instantaneous cataracts. In audio, we've had lossy, heavily data-compressed digital audio for 25 years. Originally it offered a solution for attaching music tracks to emails for transmission via dial-up modem, but how has an innovative mover and shaker such as Apple perpetuated such an unnecessary distortion of music? For all the recent excitement of iTunes' plans for streaming and internet radio, the audio is still to be delivered as lossy, heavily data-compressed crud.

They can call it and package it as they like (think “Mastered for iTunes”), but Apple knows better: Apple lossless ALAC has been around for more than a decade, and the format open-source since 2011. Producers like us have been using high-res in studios since 1993. Please let us deliver the sound quality music lovers deserve from the sources most music lovers use, not just from boutique audiophile stores with small audiophile catalogues. Beebop may be fine through earbuds plugged into a phone on the train, but lossy-compressed Mozart and jazz over a decent speaker system sound far below CD quality. It's mangled for no good reason – we all know broadband can deliver 4K video, and that the bandwidth required for lossless audio is no longer a big deal..●





## DAVEY WINDER

# "DO I GET BUSINESS LEADS FROM LINKEDIN? YOU BETCHA, MORE THAN I HAVE HAD THROUGH TWITTER"

Using social media for business is a given these days but, with an ever-growing number of choices, which is the right platform for you?

It all started when two owners of rather different small businesses asked me the same two questions: "Should I be using social media for my business?" and: "Which social network is best for business?" To question number one, my knee-jerk reaction – as someone who's been using social networks for business for more years than I can remember – was a resounding "yes". For the second question, I was tempted to spurt forth the most obvious "all of them" response – but on reflection, I had to admit that it depends on far too many different factors to sum up so simply.

One of these businesses was a good old-fashioned "products" startup, and was really looking for somewhere to not only spread the word about the stuff it makes but also to showcase new items in its portfolio. This made it relatively easy to recommend Facebook, which scores highly as a showcase platform for those businesses that are prepared to the invest time and effort to reach potential customers by way of deep engagement. Unlike the throwaway comments of Twitter – which is all the 140-character limitation really permits – the depth of information that can be posted on Facebook, including images and videos, makes it ideal for creating a presence of real value to your business. You do have to work at it, though, and you do have to fully understand the concept of social media being a two-way thing. Facebook has "community" at its core, so you must work to create a community around your business: go for interactivity and engagement, offer exclusive deals to Facebook visitors, and encourage customers to Like your page and spread the word. Give them a reason to keep coming back through

regularly updated and compelling content. This can make a real difference to your business' turnover, just as any marketing campaign can if it's properly targeted and implemented.

For the second outfit that asked the question, I felt happier recommending Twitter as their primary focus in preference to Facebook; I thought it would better suit the nature of their business, which was in the service industry. The use of Twitter as an "elevator pitch" and lead generator is ideal in this particular case. That character limit pushes business owners into really thinking about what it is they want to say, what it is they're selling, and what message they need to convey in order to get readers to click the link back to their website, and to click the hashtag to read more campaign messages. Facebook would almost certainly encourage them to

some work from a contact on LinkedIn, I thought I'd ask a question of myself: Facebook or LinkedIn for the small business? You might imagine the answer would be pretty obvious, considering that LinkedIn was created as a business-orientated network that exists solely to foster professional networking, but the thing is that LinkedIn has around 360 million members whereas Facebook has around 1.4 billion – a huge difference in potential reach. A quantity-versus-quality argument applies, but it's food for thought.

There remains a few questions to consider, namely "what is LinkedIn actually for?" and "what does it do?" As someone who's been a member for more than a decade now I'll admit that that's not an easy one to answer. I use it to post links to my work online (for self-publicity, really)

and as a way to keep in touch with a different set of contacts from the other networks. Do I check in there every day the way I do on Twitter or Facebook?

Nope. Do I read interesting posts by people in my network? Yes –

some, but not as many as I would on the other networks, because in my opinion LinkedIn's user interface sucks more than just a little, no matter which device or OS I'm using. But do I get business leads from LinkedIn? You betcha – more than I've ever had through Twitter and about on a par with Facebook – so it's certainly doing something right in terms of business exposure for me.

Seeing that quite a few of my Facebook friends run small businesses themselves, I thought it would be interesting to see what they thought about this question. Ian M uses LinkedIn for business, and thinks it far better than Facebook, although he does worry that "the increasing number of people posting quizzes is slowly turning it into Facebook". He also commented on the biggest benefit: "I can separate out different channels and get an increasing amount of PR contact". Thomas C, meanwhile, uses both, using LinkedIn to make initial contact and then Facebook for

*"Pour your energy into the platform that best suits your needs, and do that one thing really well"*

become static in their approach, by having a page that was, in effect, just a poster and not an ongoing campaign, whereas Twitter forces them to focus and dictates a degree of dynamism.

There's obviously a crossover between Facebook and Twitter for both these businesses, and you might think they'd benefit from a presence on each. And you would be right, but with one proviso: they'd have to be able to maintain the same level of input and focus on both. Far better to pour your energy into the platform that best suits your needs, and do that one thing really well, rather than divide your energies in more networks (why not LinkedIn and Pinterest as well?) and do them all okayish, so ending up with below-par returns from the lot.

### FACEBOOK OR LINKEDIN?

Having thought about this whole social-media-for-business thing a little further, and seeing as I'd just been offered



#### DAVEY WINDER

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follow-up and liaison.

Mike H admitted to having “done a little B2C marketing on Facebook. It provides a mechanism for those who don’t really use email – a growing constituency – to contact the business”. However he regards LinkedIn as “the spawn of Satan” (even though he did nearly get a consultancy job via it three years ago).

Dave C has never made a penny from either LinkedIn or Facebook, or Twitter for that matter; being a website builder, his biggest source of contacts is putting his company name on the bottom of the sites it builds – although he does admit, regarding social media, that the best business return he’s seen was “a \$60,000 profit from a single presentation on SlideShare on \$500,000 of sales”.

Richard M insists that “LinkedIn is very useful for business. I’ve got writing work directly through it, and also got work after people have found my LinkedIn profile in a search. Facebook is strictly for friends.” Derek C also separates social and business: “I find LinkedIn very useful for keeping track of staff at customer companies who change jobs. I don’t ‘friend’ work contacts on Facebook – I keep that for personal stuff.”

Confession time: I’ve never really been into separating the personal from the business when it comes to my online life. I wouldn’t offer that as a template for everyone, but for me it works because my entire career has been built around my personality. I can’t separate the “social me” from the “business me”, as we’re one and the same – indeed, were I to do so after more than two decades of keeping a high-profile online presence, I imagine it would do my business more harm than good. However, in general, I’d suggest keeping the two areas separate from the get-go. This doesn’t mean to say that you shouldn’t allow your personality to creep into your business social media presence at all, just that you should respect a boundary between the two. Setting up a LinkedIn profile, and either a Facebook page or Twitter account, for your business makes good sense, and then run as many “social” media profiles as you want. That way, not only can you focus your resources into the business side of social media to get the best return, but you can focus on online security as well.

## MITIGATING RISK

If you’re setting up social media accounts purely for your business then, one would hope, you’ll be able to assess how these might impact upon the overall security of that business. Or, to put it another way, because the social platform is being used as “just another business IT tool”, it should become second nature to factor it

into your existing IT security policy, even if that means extending or adapting the latter to fit.

Generally speaking, especially at the smaller end of the business scale, these kind of social media business accounts and the campaigns run on them are the sole domain of one or two people. Policy shouldn’t be hard to agree on, and no harder to enforce.

Sadly, the same cannot be said when it comes to social media usage within a broader business context. By way of an example, in the run-up to writing this column I happened across a piece of research (from security vendor Eset) that studied the attitudes of more than 200 IT professionals, and it made me do something of a statistical double take. It told me that 80% of the IT professionals questioned thought social media was an easy way for hackers to gain access to corporate networks, because they offer an attack surface that’s all too often not even seen as being an attack surface, and hence is neglected when it comes to security. No real surprise there. But 36% of those same professionals went on to admit their own organisations could be breached through an employee’s social media account at work, which did surprise me. I get that a large percentage would admit that, in general, the social media attack surface is a neglected one, but if you’re clued up enough to understand that, then it’s unforgivable to be complicit in leaving these social media doors open to the bad guys.

Okay, I’m not party to who these “professionals” were or what their role in their organisation was. I’m assuming – hoping even – that they weren’t part of the IT security team, nor had any input at a senior level. Even so, if they know social media can be a security threat to their business, and are in a position to be questioned by Eset about such matters, I’d have to assume that at the very least they’d be making their concerns known to their organisation, and helping to mitigate risk. Think I’m overplaying this whole “known risk” thing a tad? Think again: just because social media isn’t always thought of as part of the threat surface, it doesn’t mean it’s not.

You may think some social network is harmless to your business and can’t possibly be a point of entry into your corporate network, and ultimately into your data, but that doesn’t mean that the black hats aren’t looking for ways to make it into such a gateway by exploiting methods that actually work. These can include everything from social engineering tricks – such as targeted “spear-phishing” attacks on known employees and directors to get them to visit certain

information-stealing sites – to malware and exploit downloads.

The biggest threat, though, is the exploitation of trust. That’s easily done because trust is an explicit part of any social network: heck, it’s what the whole “network of friends” thing is based upon. The very fact that someone is in your circle of friends implies a degree of trust, that you already “know” this person and that you’ve already accepted them into your online life – so why shouldn’t you click on that link from them, or watch that video, or believe what they’re telling you? What a security policy can’t do, but security training can, is educate users to the fact that trust always has to be taken in context. If a friend has never before suggested that you should watch a video of Taylor Swift getting naked, and isn’t the type to suggest that kind of thing “in real life”, then you should be questioning why they’re messaging you with a link to such a video – but statistics suggest that a worrying number of users would click through anyway. Under such circumstances, an email, SMS or telephone call to the sender will often reveal that their account has been compromised, and they’ll be very grateful to be informed of the fact. Context, in this case, is king.

## FACEBOOK MESSENGER

To round off my column this month, here are three things to like about Facebook Messenger.

**1** You won’t need a Facebook profile to use it for much longer. North American users already have the option, when signing up for a new account, to create one using just their name and phone number, with a “not on Facebook” option.

**2** It doesn’t track you by default any more. Unless you have location services for the app enabled on your device, Facebook Messenger no longer receives location information. If you want it to send your location you have to hit the “More...” button, at the bottom right of the chat window.

**3** It’s not WhatsApp. Yes, I know WhatsApp is owned by Facebook, but that messaging app just received one star out of five in the Electronic Frontier Foundation’s privacy scorecard. It was rated separately from its parent company, and lost marks for not telling users about government data demands and not disclosing its policies on data retention, among other criticisms. Facebook did relatively well by getting four stars, only missing out on disclosure of government requests to remove data. ●





## STEVE CASSIDY

# "A SINGLE CLOUD GATEWAY SIMPLY WON'T WORK FOR THE MAJORITY OF SMALLER BUSINESSES"

Cloud security companies promise exhaustive feature sets, but smart local hardware is still the best way to manage your company's traffic

No sooner did I hear about Mr Honeyball's experiences with Cisco's Meraki operating system for Wi-Fi access (see more about this in Jon's column on p100) than a press release arrived from Daniel Druker, head of marketing at Zscaler (zscaler.com). In it, he makes a connection between Cisco's recent US\$635 million acquisition of OpenDNS, and the death of the internal company firewall. I realise that this will read like one of those web newsflashes you find yourself desperate to skip over, but I can't avoid making some comparison between Jon's reported experience and the conclusions of this producer. You might expect Druker to point to the cloud as the only safe place to put all of your security services, given that's what his company's trying to sell. But let me say straight off that the main thrust of Druker's comment – once you've swept away his references to well-known market research such as Gartner's Magic Quadrants and the rest – actually does make a fair amount of sense.

Druker believes that once you start to rely on external services to control, log, clean and vet your traffic with the wider net, it becomes very difficult to keep track of who's doing what, and where the resultant vulnerabilities are to be found. It's even hard to know whether or not these various cloud services realise that they're all fiddling about with the same stream of data from the same business. Druker believes that this basic observation will drive people towards cloud-resident security companies that supply every type of security filter anyone could ever need, and that this means he and his product portfolio have a significant lead in the marketplace.

Now I haven't yet read Jon's thoughts about Cisco Meraki, but I have been looking at the product and I do have some idea of what people are doing with security and traffic management.

I'm in no doubt that Cisco has done its usual exhaustively complete job of covering the feature set expected of this type of device; its rigorous approach may even make it a bit harder to fully engage with all those tweaks, capabilities, add-ons and architectures that the firm's deep understanding of TCP/IP and Ethernet (both wired and wireless) make possible. What I'm seeing, though, as I begin to compare these two opposite extreme views of the problem, is that it's entirely possible the whole cloud traffic-security business is strangely living in a dream world.

The problem I'm encountering time and time again, with client after client, is that businesses haven't wanted to think too hard about what they need from

✓ Commodity hardware may not tick the key boxes for your business

that box with some blinking LEDs on it, which sits under a desk beside the rat poison saucer – and which, incidentally, just happens to be responsible for linking them up to all the data they can't live without. It's not just that they're a few months behind on the reading list that the hardcore security guys recommend (and here I should call upon another of our RWC gurus, Mr Winder, who has that whole subject nailed – whereas I'll freely admit that I don't). No, it's more that they don't even vaguely understand the terms or landscape within which security plays itself out.

There's no point of contact for them, no tangible risk that they can actually relate to real life. Most of these people have been told what to buy by their ISPs' helpdesks. What's more, whenever the word "firewall" came up in those conversations, I can tell you through empirical study – that is, via eavesdropping on at least 20 such help calls from the client end – that the standard reply is "oh yeah, this is as



### STEVE CASSIDY

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△ There's much to be said for running a local firewall, rather than outsourcing the job to a cloud provider

good as a firewall". All that ISP support guy wants to do is encourage them to purchase a fully supported DSL router, then get off the line so he can go and fetch his fish and chips.

If my sample is a faithful observation of the sorry state of our security business – and a goodly few visits to subscribers and clients alike, as well as off-the-record chats with ISP operators (and even some router manufacturers) suggest that it is – then the bold truth about cloud security is that it hasn't been competing with smart firewall-like devices at all. It's actually been competing with the dumbest boxes that a minimal spend can buy.

In this kind of business deployment, the customer wants to sound as though they've thought about security, but they're also sensitive to that tinge of contemptuous disregard in the information they're being given – that faint hint that grown-ups shouldn't really be worrying themselves about this stuff – be that from a security consultant, an ISP helpdesk, or that mate who went through all this months ago. So they purchase the lowest-common-denominator box they can find, then discover it doesn't quite do what they wanted, although it does have many tickboxes and radio buttons in its web interface (probably designed by the losers of every round of "Best UI in technology, 1989") and its name is visible on their ISP's compatibility list.

They'll then want to get something that actually works, something that seems to provide a bit of sensible logging of what their users are up to, plus a

checkbox when someone asks them if their emails are being scanned for Word macro viruses. But rather than going back to that little LED-encrusted-box marketplace, they sign up for narrow-scope, cloud-based security scanners.

The all-time granddaddy of these services is Websense, which one might politely say "grew up alongside" the threats it was trying to protect against by achieving good market penetration in big old corporate PC deployments. This represented rather a bad start for cloud-based security: Websense got very excited about blocking things that didn't really need to be blocked, and achieved a pretty impressive record for including things in its block lists that were nothing to do with the list of banned topics. It took some while to mature into the huge range of services we see today. And, in common with everyone else in the market, it set up shop by completely

*"If there's one thing the cloud is supposed to facilitate above all else, it's competition"*

bypassing the basic firewalls in use back in the day. It took several years before firewall manufacturers started to blur the distinction between inside and outside by including an option to pass your web traffic through a Websense proxy rather than directly to its intended recipient.

I feel relatively safe in being rude about this early adopters' darling because the market has reacted, with crystal-clear capitalist logic, by quickly attracting many competing products into the same sector. This self-same market is still growing today, and if there's one thing the cloud is supposed to facilitate above all else, it's competition. If you see a slightly better web-proxy filter, then by all means flip to it. If a different firewall vendor floats your boat, then simple configurations of your business network will allow you to run more than one gateway or more than one route to the internet. That is, after all, why most business connections come with a little pocket-sized range of IP addresses. Getting monotheistic about a single cloud service provider isn't likely to grant you the ability to steer the relevant

traffic towards the most relevant, fit-for-purpose filters. This is why I think that a single cloud gateway simply won't work for the majority of smaller businesses.

Clearly, Cisco agrees: you may be working on your wider configuration via a cloud service, but the results of that work will turn up in the config of your local access device. I can see frowns appearing, especially among those who have bought into that evangelical idea about universal Wi-Fi access – "why get so freaked about security dude, when everything wants to be free anyhow?" Look at my Skype guest-user anecdote over the page for at least one answer to this doctrine of universal liberty, but there's no need to get all bothered about such extreme cases in order to justify smart local hardware.

A variety of internet links will be sufficient evidence to shift the best location for traffic management back to right inside your office.

I've written before about how hard it is to find devices that can exploit multiple ISP connections for your internet traffic. The ability is present in many feature lists, and most people think "that should work". Sadly, it normally doesn't. Router and firewall makers have been notorious for paring down their feature sets for the past two decades, possibly longer. The evolution of new features has been agonisingly slow, while at the same time not being held back by an excess of hard thinking or shifting of standards.

Getting what small- to medium-sized businesses want in terms of traffic control has been a long and regrettable process, with many discovering that some promises – such as active failover between different lines, for example – simply aren't kept when the bad day arrives. And testing this stuff really hurts: you can only tell you have a problem when there are lots of real users, with lots of varied traffic types and use cases to play with – getting them all fired up to test your firewall is a tall order. Most businesses don't take kindly to this kind of macho test regime.

It might seem as though this observation supports the cloud faction's assertion about the death of the firewall, but I think they're actually trailing behind the reality of modern business. By the time you're live on the web with your brand and your workflow, the idea that you could sensibly live without it (or live with your workforce's





^ An innocent business tool could expose you to unexpected liabilities

persistently perilous leisure-surfing habits) is laughable. That second cheap DSL line, with a matching policy in your edge router to corral every YouTube URL, is a far simpler way to keep your vital services running than trying to do it all via a remote server, passing through dumb devices that were never designed to have a cloud-managed role in the very first place.

## THOSE MEAN OL' SKYPE GUEST-USER BLUES

If there's one thing I hate doing, it's finding IT reasons to have someone fired. This is never pleasant, and not without its risks to the "expert" involved. Almost every time I'm asked to participate I'll refuse, preferring to suggest lines of enquiry to the poor IT bloke caught up in the middle of this situation, rather than put my name or any presumed official status at stake in what can be rather an acrimonious business. But sometimes, snippets fall out of this process that make my hair stand on end, and I just have to pass them on to you.

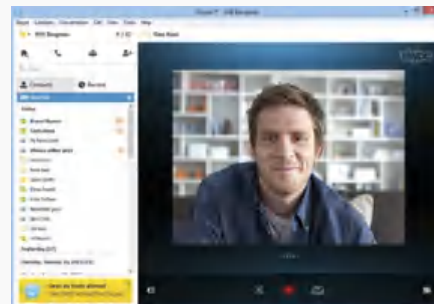
In this particular case, the grounds for the person being fired were more or less what I've come to expect: "persistent, long-term abuse of company assets for immoral purposes, yada, yada, yada". This charge is employed as a way to avoid too many single-incident expulsions by overzealous security gurus, just because someone left their computer logged in and a bored security guard toured the offices looking for some means of distraction in the wee small hours. A certain quantity of smut in their internet cache, or a web history involving

*"I wouldn't like to presume that there are readers out there whose Skype uploads might get them into trouble"*

NSFW domains can be ignored, or so the logic would have it.

In this case, it was presumed to be worse because it concerned the uploading of files, not the downloading. Quite a few of them actually, as discovered within the storage Skype uses within the roaming folder of that user's profile inside Windows 7. The firm's argument was that while one saucy picture is all well and good – a bit like that urban myth about the Christmas party and the photocopier – a number of multi-megabyte items spread over several months is a different matter altogether. Critically, as with that photocopier urban myth, the precise identity of the person taking the pictures wasn't immediately derivable from the personal parts visible in the shots, shall we say.

The key trick here was all about Skype's policies on storing uploaded media. While it may look as though Skype retrieves a file only when the other called party is online and available (which I guess defines Dropbox's market opportunity of a few years back, almost completely), it's far from clear what Skype does with the files that a user presents for upload. In particular, there's no provision for consent to caching or downloading of those materials when a



Skype user asks to sit at your PC briefly just to collect their messages or to make a quick call. In this case it emerged that the sacked employee's only sin was to let a visitor – one with, evidently, a pretty exciting home life – gain access to a messaging system that then, without any announcement, decided a local cached copy of all said guest's pictures was the most important way to employ the provided bandwidth. To any observer who doesn't put lots of pictures up on the platform, such a picture dump can look like received (and therefore, as the employer argued, requested) material.

I have two points to make here. The first is that it's simply foolish of Skype to put these people – both the guest and the obliging host – in this position without letting either of them know this will happen. The second is that, arguably, the guilty party in this whole sorry affair is neither of the people involved in the incident, but rather the ignorant and presumptive team of IT investigators, HR "persons" (I say that because I'm not entirely convinced of their humanity) and employment lawyers, whose world view ruled the day and lost someone their job.

There's really very little recovery from a situation like this, since reinstating the offender would be just about the most hollow victory imaginable, and compensation won't excuse the mistakes made. But at least I can take a swipe at Microsoft and Skype for this sorry example of what happens when cloud services don't make their decisions about where to put your data visible, nor indeed reversible, until it's far too late.

I wouldn't like to presume that there are PC & Tech Authority readers out there whose Skype uploads might contain material that could get them, or anyone else, into trouble. However, I'd certainly suggest that a rigorous approach to cleaning up after yourself, or at least being given the opportunity to choose to do such a cleanup, is high on the list of tickboxes when deciding which service to use for such leisure activities. ●





# SOUTH AUSTRALIA WILL PLAY HOST TO THE FIRST LIVE TRIALS OF DRIVERLESS CARS ON AUSTRALIAN PUBLIC ROADS

When tech takes the wheel. By **Ry Crozier**

The trials are part of a program initiated by road research agency ARRB Group, and will be conducted with partners including Telstra, Bosch, Volvo, Flinders University, Carnegie Mellon University, the RAA and Cohda Wireless. The first trial is scheduled to take place on the Southern Expressway on November 7 and 8. It will involve "multiple vehicles conducting manoeuvres such as overtaking, lane changing, emergency braking and the use of on and off ramps", according to an SA government statement.

The cars to be used in this first trial are the same as those used in Volvo's Drive Me project. Drive Me aims to put 100 self-driving cars into the hands of customers in Sweden's second-largest city Gothenburg by 2017. RRB's group managing director believed there was some urgency for Australia to begin public road trials with driverless cars. "Automated vehicles are far from science fiction, but rather a short-term reality that Australia needs to be prepared for," he said.



His view was backed by Penny Gale, general manager of public affairs at the Royal Automobile Association (RAA) of South Australia. "By 2020 all cars that come off the production line will have some ability to drive themselves, and we need to prepare," Gale said.

Cars used in Volvo's Drive Me program come armed with "multiple radars, cameras and laser sensors" which aim to

*"When autonomous driving is no longer available the driver is prompted to take over"*

build a 360° view of the car's surrounds. Various cameras are used to monitor lane markings, detect objects in front of the car – including pedestrians or "unexpected road hazards".

## DRIVE OR BE DRIVEN

Volvo sees both safety and quality-of-life benefits in encouraging the adoption of self-driving cars. Its senior vice president of research and development Dr Peter Mertens believed such cars would "fundamentally change the way we look at

< Virtual eyes maintain a constant all-angles view  
✓ And you thought Prius drivers were smug...

driving". "In the future, you will be able to choose between autonomous and active driving," Dr Mertens said. "This transforms everyday commuting from lost time to quality time, opening up new opportunities for work and pleasure."

One of the key challenges for engineers working on the cars is designing backup systems that can cut in if the car's "autopilot" stopped working. "The main challenge is to design an autopilot that is robust for traffic scenarios as well as for technical faults that may occur," Dr Mertens said. "It cannot be expected that the driver is ready to suddenly intervene in a critical situation."

He continued: "When autonomous driving is no longer available – due to exceptional weather conditions, technical malfunction or the end of the route has been reached – the driver is prompted by the system to take over again. "If the driver is incapacitated for any reason and does not take over in time, the car will bring itself to a safe place to stop."

## MORE STATES INVITED

The ARRB-led Australian trial will occur over at least four phases – and is likely to reach public roads in more places than South Australia. "The trials in South Australia this November will be the first of many trials nationally, with discussions underway in a number of jurisdictions," the group said. "ARRB Group is calling for additional states, territories and partners to support this important national research initiative."

The trial is not the only Australian self-driving car initiative, but it is the most advanced. Last year, GoGet and UNSW equipped a car-share vehicle with sensors to test the kinds of detection systems needed by future driverless vehicles; however the car itself isn't driverless. The ARRB trials come less than a week after Google expanded its own trials of self-driving cars in the US to the public roads of Austin, Texas. Google's trials have previously been limited to Mountain View, California.

For more content like this, do please visit the ACS Information Age website at <https://ia.acs.org.au>



# WHY EX-TELSTRA CABLERS DON'T WANT NBN WORK, BY RY CROZIER

“The NBN has spent five years and millions of dollars trying to convince us it can attract the thousands of skilled workers it needs to complete the rollout by 2020. Back in 2010, Innovation and Business Skills Australia (IBSA) warned the project faced “a major shortfall of skilled workers”, which it quantified as around 8000 cablers. Months later, the formerly-named NBN Co itself forecast a need for 15,000 to 20,000 full-time workers to cope with peak construction demands, later revising the number to 16,000 to 18,000.

Five years on – and with a new strategy to roll out multiple connection technologies rather than mostly fibre – the NBN is still facing a large shortfall of workers. NBN now hopes a new \$40 million training scheme will be enough to attract former Telstra cablers (“late-stage career workers”) back to the industry, as well as bring a new generation of young workers in.

It's not the first time NBN or the Government has tried to build an NBN workforce from former Telstra staff. Telstra has been given \$100 million in Government funding to retrain some 6500 construction and maintenance personnel that were expected to be

displaced “as a consequence of the rollout of the NBN”.

The scope of this retraining fund was revised in December last year to reflect the shift in rollout strategy by the Government, though its purpose is fundamentally the same. “All eligible Telstra employees may be retrained,” Communications Minister Malcolm Turnbull said in May this year. “In order to be eligible, Telstra must be satisfied that the employee may otherwise face redundancy as a consequence of the rollout of the NBN. In addition, Telstra's copper/HFC (hybrid fibre coaxial) based field workforce are automatically eligible for retraining.”

However, this is clearly not getting enough ex-cablers on the streets, with NBN now specifically looking for skilled personnel that are no longer with Telstra and therefore have been ineligible for this funded training. At least one cabling expert believes the latest \$40 million initiative won't be enough to convince many former Telstra cablers to return or young people to join.

Kevin Fothergill, the registrar of cablers for the Telecommunications Industry Training Advisory Board (TITAB Australia), has been warning successive governments and NBN management “for many, many moons” about the challenges in finding skilled workers to complete the rollout. “We've said consistently that a lot of the ex-Telstra people will not come back into the industry,” Fothergill told *PC & Tech Authority*.

“A lot of ex-Telstra people have been burnt. They've come back into the industry before and worked as contractors or subcontractors, and the work's run out after three or six months because it's moved on. “You can't run an



**“All eligible Telstra employees may be retrained, Malcolm Turnbull said”**

industry like that.”

Likewise, to attract younger people into the cabling industry, they would need to be convinced that it was a career path with some stability and longevity of prospects, he said. “With young people, you've got to have a certificate-based training program like an apprenticeship where you bring them in and they've got continuous work,” Fothergill said. Fothergill said even experienced cablers needed to be offered a mix of short and long training courses. NBN has previously said it would offer as little as a fortnight's retraining to get experienced people on the job.

For its part, NBN claims there will be “long term opportunities” created – particularly for young people – at its construction contractor partners, some of whom will remain involved in the project once construction finishes to operate or maintain network assets.

*For more content like this, do please visit the ACS Information Age website at <https://ia.acs.org.au>*

**Jon Honeyball will return to Epilog in the next issue of *PC & Tech Authority***



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